Journal of the Royal Society of Arts

NO. 4954 FRIDAY, 24TH JUNE, 1955 VOL. CIII

ANNUAL GENERAL MEETING

The Council hereby gives notice that, in accordance with the Bye-Laws, the Two-Hundred-and-First Annual General Meeting, for the purpose of receiving the Council's Report and the Financial Statements for 1954, and for the election of officers, will be held on Wednesday, 6th July, 1955, at 3 p.m., at the Society's House.

(By Order of the Council)

KENNETH WILLIAM LUCKHURST,
Secretary.

EXHIBITION OF EUROPEAN MEDALS, 1930–1955

The Society's Exhibition of European Medals was opened on Wednesday, 8th June, by Professor A. E. Richardson, P.R.A., and a paper on '*The Art of the Modern Medal*' was read by Dr. C. H. V. Sutherland, Deputy Keeper of Coins, Ashmolean Museum, Oxford.

The exhibition, which consists of medals made in Western Europe during the past 25 years, has been organized by a committee representing the Royal Society of Arts, the Royal Numismatic Society, and the Fédération Internationale des Éditeurs de Médailles. The Members of the Committee are Sir Ernest Goodale, C.B.E., M.C. (*Chairman*); Sir Gordon Russell, C.B.E., M.C., R.D.I., Mr. K. W. Luckhurst and Mr. R. V. C. Cleveland-Stevens (*Royal Society of Arts*); Dr. C. H. V. Sutherland (*Royal Numismatic Society*); Mr. L. S. Forrer and Mr. D. F. Spink (*Fédération Internationale Des Éditeurs de Médailles*). The Fédération kindly made itself responsible, in the first instance, for the collection of material from the Continent: the selection of British exhibits was undertaken by the organizing committee. The object of the exhibition is to call attention to contemporary medals as a form of art deserving much more public interest and support than it has for some time received, and contributions are included from Austria, Belgium, Denmark, Finland, France, Holland,

Italy, Norway, Portugal, Spain, Sweden, Switzerland, and from this country. It was, unfortunately, not possible to secure exhibits from Western Germany. The emphasis in the exhibition has been placed throughout on the designer himself who is, of course, primarily responsible for the artistic content of his medal.

In addition to the medals, a small number of coins, made by exhibiting medallists, is shown for comparative examination. There are certain other special exhibits as well: the Director of the Paris Mint has been good enough to provide a technical feature of great interest and, by the kindness of the Deputy Master and Comptroller, the Royal Mint shows a series of official English coronation medals from King Edward VI to the present day. The Society provides a case of medals intimately associated with its history.

The Exhibition Handbook, which contains in addition to a full list of exhibits and the names of manufacturers concerned a shortened version of Dr. Sutherland's paper read at the opening, can be obtained from the Secretary for 1*s*.

The exhibition remains open until 29th June.

THE LIBRARY

Fellows are reminded that for the duration of the Exhibition of European Medals (that is until 29th June), as was announced in the last issue of the *Journal*, the Library will not be available as a reading room or for the service of teas. The Parlour, however, will continue to be in use for these purposes, and books may be borrowed and consulted as usual.

BICENTENARY MEDAL FOR 1955

The Council has awarded the Bicentenary Medal for 1955 to Sir Charles Tennyson, C.M.G., for his outstanding services to the promotion of industrial design.

Sir Charles was Chairman of the Board of Trade Utility Furniture Committee in 1943 and of the Board's Furniture Production Committee in 1944. He formed and was Chairman for 25 years of the Industrial Art Committee of the Federation of British Industries and was Chairman, throughout its career, of the National Register of Industrial Art Designers. He has been Chairman of the Design & Industries Association, and was also Chairman of the war-time Central Institute of Art and Design. He is an Honorary Fellow of the Royal College of Art.

It will be remembered that the Bicentenary Medal was instituted last year as a permanent commemoration of the Society's Bicentenary and is to be awarded annually 'to the person who in a manner other than as an industrial designer has exerted an exceptional influence in promoting art and design in British Industry'.

DESPATCH OF JOURNALS IN ENVELOPES

Special arrangements for posting *Journals* flat in envelopes instead of in the usual postal wrappers are made in cases where Fellows require, for subsequent binding purposes, that their *Journals* should arrive unfolded. Fellows wishing to take advantage of this arrangement are asked to notify the Secretary.

MEETING OF COUNCIL

A meeting of Council was held on Monday, 13th June, 1955. Present: Sir Ernest Goodale (in the Chair); Sir Alfred Bossom; Sir Frank Brown; Sir Edward Crowe; Mr. John Gloag; The Earl of Halsbury; Dr. R. W. Holland; Mr. William Johnstone; Lord Latham; Mr. F. A. Mercer; Lord Nathan; Professor A. E. Richardson; Mr. A. R. N. Roberts; Sir Harold Saunders; Sir Selwyn Selwyn-Clarke; Sir John Simonsen; Professor Dudley Stamp; Sir Stephen Tallents; Mr. William Will; Sir Griffith Williams and Mr. J. G. Wilson; with Mr. K. W. Luckhurst (Secretary), Mr. R. V. C. Cleveland-Stevens (Deputy Secretary) and Mr. David Lea (Assistant Secretary).

ELECTIONS

The following candidates were duly elected Fellows of the Society:

Ariff Abdullah, Penang, Malaya.
Bailey, Gordon Lennox James, B.Sc., Ph.D., A.R.C.S., West Drayton, Middx.
Blood, Sir Hilary Rudolph Robert, G.B.E., K.C.M.G., LL.D., M.A., London.
Bodansky, Ernest, Bromsgrove, Worcs.
Bramall, Eric, Llandudno, Caerns.
Brown, Geoffrey Frederick, F.C.I.S., F.C.W.A., Kidderminster, Worcs.
Bunker, Henry James, M.A., Kingston-on-Thames, Surrey.
Caldbeck, Harry, Wythenshawe, Manchester.
Davies, David Ronald, London.
Delany, Vincent John, F.C.C.S., Banstead, Surrey.
Enticknap, Albert, London.
Garner, Harold John, Guildford, Surrey.
Harding, Frank James William, M.A., B.Litt., A.L.A., Kenton, Middx.
Horne, Major William Guy, London.
Howison, Mrs. Œnone Noël, London.
Ireland, Roy John, London.
Jacobus, Arthur, D.Phil., A.R.I.C., Warwick.
Kaicker, Amrit Krishnan, Mombasa, Kenya.
King, Thomas Lesley, Newcastle-on-Tyne.
Lowder, Hugh Gordon, London.
Lowdon, James William, B.Sc., M.I.C.E., Kuwait, Persian Gulf.
Mackay, Donald Cameron, Halifax, Nova Scotia, Canada.
Maclennan, Alexander, Trumpington, Cambridge.

Mehta, Madhukant (Heman) Jinabhai, M.Com., Navsari, Bombay, India.
Mishra, Ganesh Ram, Raipur, M.P., India.
Oakley, Thomas, B.A., Toronto, Ontario, Canada.
Roberts, John Trevor, A.R.I.B.A., Ampthill, Beds.
Slattery, Richard, Ruislip, Middx.
Smith, William Victor, A.R.I.B.A., Luton, Beds.
Sutton, George James, Nairobi, Kenya.
Tan Hoo Watt, Singapore.
Thomas, David Christopher Traherne, B.A., London.
Talbot, Gordon Henry, Cheltenham, Glos.
Ward, Professor Basil Robert, F.R.I.B.A., Hon.A.R.C.A., London.
Ward, Neville, B.Arch., A.R.I.B.A., London.
Welbury, Ritson, Newcastle-on-Tyne.
Wibberley, Gerald Percy, M.Sc., Ph.D., Ashford, Kent.
Wriglesworth, Kenneth William, A.R.I.B.A., Kew, Surrey.

The following was admitted as an Institution in Union under Bye-Law 66:

Laval University, Quebec, Canada.

EXAMINATIONS

It was reported that the entries for the Summer series of Examinations totalled 87,260 as compared with 71,254 in 1954.

McKNIGHT KAUFFER MEMORIAL EXHIBITION

It was agreed to appoint a representative to the Council set up by the Society of Industrial Artists in connection with the McKnight Kauffer Memorial Exhibition (which is to be held at the Victoria & Albert Museum in the autumn), and to make a contribution towards its expenses.

CANADA AND THE UNITED STATES

Consideration was given to several suggestions for future activity of the Society in Canada and the United States arising from the Secretary's recent tour.

OTHER BUSINESS

A quantity of financial and other business was transacted.

FINANCIAL STATEMENTS FOR 1954

The following statements are published in accordance with Section 25 of the Society's Bye-laws

BALANCE SHEET, 31st December, 1954

1953 £		£	£
	General Fund Accounts—		
95,554	General Purposes Capital Account per annexed account (page 537)	97,695	
6,423	Dr. Cantor's Bequest	6,008	
2,602	Lord Bennett's Bequest	2,548	
8,204	Henry Morley's Bequest	7,468	
1,930	Dorothy Corfield's Bequest	2,163	
	Life Composition Account (page 537) :		
10,679	Unexpired balance of compositions received on the basis of taking credit for such compositions over a period of 12 years from their receipt	11,933	
125,392			127,815
	Specific Fund Accounts (page 537)—		
10,836	Amount accumulated towards pensions payable under Modified Superannuation Scheme	10,495	
2,692	Provision for Rehabilitation of Building, including £500 gift in memory of the late Lord Amulree ...	1,564	
202	Industrial Art Bursaries Fund Account	244	
13,730			12,303
	Liabilities—		
4,965	Creditors	7,705	
3,232	Industrial Art Bursaries awarded (but not expended) ...	3,637	
612	Preservation of Ancient Cottages Fund	13	
	Uninvested Trust Capital :		
1	Cadman Memorial Fund	1	
5	Dr. Swiney's Bequest	259	
1,794	Unexpended Trust Income *less* Income over expended (page 539)	1,647	
59	Contributions received for Industrial Art Bursaries to be awarded in 1955	61	
10,668			13,323
149,790	Carried forward		153,441

		£	£	1953 £
	General and Specific Fund Assets—			
	Freehold Property, 6/8 John Adam Street			
	Cost in 1922, plus additions, *less* sales and compensation received		49,788	49,788
	Pictures, Books, Furniture and Fixtures (as fixed in 1919)		10,000	10,000
	Investments :			
	Freehold Ground Rents, at cost	3,641		4,825
	Securities (page 538) :			
	General (Market Value £40,945—1953 £25,450)	41,684		27,345
	Dr. Cantor's Bequest (Market Value £5,804—1953 £5,698)	5,941		6,356
	Lord Bennett's Bequest (Market Value £2,489—1953 £2,495)	2,548		2,602
	Henry Morley's Bequest (Market Value £7,295—1953 £7,099)	7,468		8,204
	Dorothy Corfield's Bequest (Market Value £2,070—1953 £2,047)	2,119		1,887
	Held towards meeting pensions payable under Modified Superannuation Scheme (Market Value £8,260—1953 £9,946)	8,238		10,079
	Fund for Rehabilitation of Building (Market Value £2,400—1953 £2,287)	2,500		2,500
			74,139	63,798
			133,927	123,586
	Stocks of Stationery and Working Papers of Examinations Department at value estimated by the Society's printer	3,002		3,256
	Stock of "History of the R.S.A." at cost, *less* sales ...	2,772		—
	Debtors and Payments in Advance	5,914		5,008
	Deposit with Finance Company	—		6,000
	Balances with Bankers and Cash in Hand	7,826		11,940
			19,514	26,204
	Carried forward		153,441	149,790

BALANCE SHEET, 31st December, 1954—*continued.*

1953		£	£
£			
149,790	Brought forward		153,441
	Trust Fund Accounts—		
26,946	Capital Account : Balance at 31st December, 1953 ...	27,039	
—	*Add :* Receipts in respect of the Thomas Gray Trust ...	1,798	
—	Fred Cook Memorial Fund	1,000	
—	Profits *less* losses on sale of investments	422	
93	Profit on Sale of Freehold Ground Rents ...	80	
27,039		30,339	
1,794	Unexpended Income (net)	1,647	
28,833			31,986

Note :

Credit has been taken for the whole of the subscriptions received during the year, although some relate to periods expiring after the date of the Balance Sheet, but no credit has been taken for subscriptions due but unpaid at 31st December, 1954.

	£	£	*1953* £
Brought forward		153,441	*149,790*
Trust Fund Assets—			
Capital : Investments (page 538) :			
Freehold Ground Rents, at cost ...	1,716		*1,890*
Securities (Market Value £28,862—1953 £25,464)	28,363		*25,143*
	30,079		*27,033*
Uninvested Funds	260		*6*
	30,339		*27,039*
Income due from the Society	1,647		*1,794*
		31,986	*28,833*

On behalf of the Council

E. MUNRO RUNTZ, *Chairman.*

PETER A. LE NEVE FOSTER } *Treasurers.*
ALFRED BOSSOM }

£178,623		*£185,427*

Report of the Auditors to the Council and Fellows of the Royal Society of Arts.

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. In our opinion proper books of account have been kept by the Society so far as appears from our examination of those books. We have examined the above Balance Sheet and annexed Income and Expenditure Account which are in agreement with the books of account. In our opinion and to the best of our information and according to the explanations given us the Balance Sheet gives a true and fair view of the state of the Society's affairs as at 31st December, 1954, and the Income and Expenditure Account gives a true and fair view of the income and expenditure for the year ended on that date.

3 London Wall Buildings,
London, E.C.2.
17th June, 1955.

DELOITTE, PLENDER, GRIFFITHS & CO., *Auditors.*
Chartered Accountants.

INCOME AND EXPENDITURE ACCOUNT

for the Year ended 31st December, 1954

EXPENDITURE

1953		£	£
	Printing and Publishing *Journal*—		
5,647	Printing and Paper	6,152	
989	Postages	1,107	
231	Reviews, Shorthand Reports and other expenses	250	
6,867			7,509
1,361	Library—Salaries, Books, etc.		1,642
152	Cost of Albert and Society's Medals and R.D.I. Expenses		110
	Industrial Art Bursaries—		
200	Contribution to Fund	200	
223	Expenses of Competition	310	
423			510
175	Cantor and Morley Lectures		135
	Examination Expenses—		
9,862	Examiners' Fees	11,010	
6,175	Stationery and Printing	6,822	
5,124	Other Expenses	6,274	
12,445	Proportion of Salaries as below	13,273	
350	Proportion of House and Office Expenses as below	391	
33,956			37,770
42,931	Carried forward		47,685

INCOME

1953		£	£	£
	Annual Subscriptions received during year		16,629	15,251
	Registration Fees		1,180	893
	One-twelfth of Life Compositions received during twelve years to date		1,877	1,659
	Donations		35	7
	Income from—			
	Ground Rents	153		178
	General Fund Investments	833		840
	Dr. Cantor's Bequest	155		199
	Lord Bennett's Bequest	77		77
	Henry Morley's Bequest	261		261
	Dorothy Corfield's Bequest	69		67
	Trust Funds for General Purposes	265		239
	Bank and Deposit Accounts	297		195
			2,110	2,046
	Interest received on War Damage Claim		—	156
	Sales of *Journal*, etc.	898		813
	Advertisements in *Journal*	1,844		1,770
			2,742	2,583
	Examination Fees	39,671		36,431
	Sales of Examination Papers and Advertisements	2,511		2,208
			42,182	38,639
	Rents Receivable		413	410
	Carried forward		67,168	61,644

1953				
£		£	£	
42,924	Brought forward		47,685	
21,438	Salaries, Wages and Superannuation Scheme	22,408		
12,445	*Less:* Proportion estimated to be applicable to Examinations above	13,273		
8,993			9,135	
	House and Office Expenses—			
837	Rates and Insurance	1,044		
145	Repairs, Renewals and Decorations	199		
716	Lighting, Heating, Cleaning, Expenses of Meetings and General Charges	1,153		
1,804	Stationery, Printing, Postages, Telephone, Audit and Accountancy and other Office Expenses ...	1,325		
3,502		3,912		
350	*Less:* Proportion (10 per cent.) allocated to Examinations above	391		
3,152			3,521	
1,991	Pensions	1,616		
931	*Less.* Charged against Modified Superannuation Scheme Fund Account	744		
1,060			872	
—	Bicentenary Celebration Expenses		3,683	
5,505	Excess of Income over Expenditure carried to General Purposes Capital Account		2,274	
61,644			67,168	

1953			
£		£	£
61,644	Brought forward	67,168	61,644

GENERAL PURPOSES CAPITAL ACCOUNT

for the Year ended 31st December, 1954

1953		£
£		
—	Losses *less* Profits on sale of investments	622
97,554	Balance per Balance Sheet	97,695
	(N.B.—Provision has not been made for War Damage Repairs still outstanding nor credit taken for further amounts recoverable from the War Damage Commission.)	
£97,554		£98,317

	1953
£	£
Balance at 31st December, 1953 ... 95,554	88,658
Repairs recovered from the War Damage Commission 31	1,176
Proceeds of Sale of Books from Library 4	110
Profit on Sale of Freehold Ground Rents 454	25
Legacy from Dr. G. B. Schluter ... —	100
Excess of Income over Expenditure per foregoing account 2,274	5,505
£98,317	£95,554

LIFE COMPOSITION ACCOUNT for the Year ended 31st December, 1954

1953		£
£		
	Amount taken into the Society's Income—	
	One-twelfth of Compositions received during twelve years to date	1,877
1,659		
10,679	Balance per Balance Sheet	11,933
£12,338		£13,810

	1953
£	£
Balance at 31st December, 1953 ... 10,679	10,372
Compositions received during year ... 3,131	1,966
£13,810	£12,338

SPECIFIC FUND ACCOUNTS for the Year ended 31st December, 1954

1953	**Amount accumulated towards pensions payable under Modified Superannuation Scheme—**	
£		£
11,417	Balance at 31st December, 1953 ...	10,836
351	*Add :* Interest on Investments ...	359
—	Profit on redemption of Investment	44
11,768		11,239
832	*Deduct :* Proportion of Pensions paid during year ...	744
£10,836		£10,495
	Provision for Rehabilitation of Building—	
£		£
2,817	Balance at 31st December, 1953 ...	2,692
75	*Add :* Interest on Investment ...	75
2,892		2,767
—	*Deduct :* Repairs and Renewals (including War Damage) charged against Fund...	1,203
£2,892		£1,564

1953	**Industrial Art Bursaries Fund Account—**		
		£	£
	Balance at 31st December, 1953 ...	202	125
	Add : Contributions received ...	2,292	2,252
	Appropriation from Art Congress Studentship ...	50	75
		2,544	2,452
	Deduct : Bursaries awarded for 1954 ... ... £2,500		2,450
	Cost of pamphlets and other Expenses 310		293
		2,810	2,673
	Less : charged against Income and Expenditure Account 510		423
		2,300	2,250
		£244	£202

INVESTMENTS

31st December, 1954

		Cost
Society		£
£5,000	British Transport 3 per cent. Stock 1978/88	4,820
£10,000	3½ per cent. Conversion Stock 1969	10,189
£20,000	British Electricity 4½ per cent. Stock 1974/79	23,871
£7,000	2½ per cent. Consolidated Stock	4,804
		£41,684
Dr. Cantor's Bequest		
£6,048	3½ per cent. Funding Stock 1999/2004	Cost £5,943
Lord Bennett's Bequest		
£2,593	3½ per cent. Funding Stock 1999/2004	Cost £2,548
Henry Morley's Bequest		
£7,603	3½ per cent. Funding Stock 1999/2004	Cost £7,469
Dorothy Corfield's Bequest		
£2,157	3½ per cent. Funding Stock 1999/2004	Cost £2,119
Modified Superannuation Scheme		
£4,709	4 per cent. Funding Stock 1960/90	Cost £4,709
£1,536	3 per cent. Funding Stock 1959/69	1,529
£2,000	3 per cent. Savings Bonds 1960/70	2,000
		£8,238
Fund for Rehabilitation of Building		
£2,500	3 per cent. Savings Bonds 1960/70	Cost £2,500
Trust Funds		
	Dr. Aldred Trust.	Cost or value when received in trust
£142	3½ per cent. Funding Stock 1999/2004	£140
	Art Congress Studentship.	
£1,495	3½ per cent. Funding Stock 1999/2004	1,469
	R. B. Bennett Empire Prize Trust.	
£1,463	3½ per cent. Funding Stock 1999/2004	1,437
	Sir George Birdwood Memorial Fund.	
£678	3½ per cent. Funding Stock 1999/2004	666
	Selwyn Brinton Trust.	
£1,013	3½ per cent. Funding Stock 1999/2004	995
	Alfred Davies Bequest.	
£1,988	3½ per cent. Funding Stock 1999/2004	1,953
	Le Neve Foster Trust.	
£372	3½ per cent. Funding Stock 1999/2004	365
	John Fothergill Trust.	
£251	3½ per cent. Funding Stock 1999/2004	247
	Thomas Gray Memorial Trust.	
£9,048	3½ per cent. Conversion Stock 1961 or after	£7,000
£1,174	3½ per cent. War Stock 1952 or after	995
£212	British Transport 3 per cent. 1978/88	179
£663	3½ per cent. Funding Stock 1999/2004	651
		8,825
	Howard Trust.	
£472	3½ per cent. Funding Stock 1999/2004	461
	Owen Jones Memorial Trust.	
£480	3½ per cent. Funding Stock 1999/2004	472
	Neil Matheson McWharrie Trust.	
£338	3½ per cent. Funding Stock 1999/2004	332
	Dr. Mann Trust.	
£949	3½ per cent. Funding Stock 1999/2004	932
	Mulready Trust.	
£102	3½ per cent. Funding Stock 1999/2004	100
	North London Exhibition Trust.	
£135	3½ per cent. War Stock 1952 or after	185
	Sir William J. Pope Memorial Fund.	
£345	3½ per cent. Funding Stock 1999/2004	339
	Russian Embassy Prize.	
£92	3½ per cent. Funding Stock 1999/2004	91
	Benjamin Shaw Trust.	
£86	3½ per cent. Funding Stock 1999/2004	85
	John Stock Trust.	
£64	3½ per cent. Funding Stock 1999/2004	63
	Dr. Swiney's Bequest.	
	Freehold Ground Rents	£1,716
£4,461	3½ per cent. Funding Stock 1999/2004	4,382
		6,098

INVESTMENTS—*continued*

Trueman Wood Lecture Endowment Fund.	
£860 3½ per cent. Funding Stock 1999/2004	£845
Cadman Memorial Fund.	
£358 3½ per cent. Funding Stock 1999/2004	351
Thomas Holland Trust.	
£414 3½ per cent. Funding Stock, 1999/2004	406
E. Frankland Armstrong Trust.	
£527 3½ per cent. Funding Stock 1999/2004	518
Joseph Paxton Memorial Trust.	
£1,147 3½ per cent. Funding Stock 1999/2004	1,127
A. C. Bossom Lecture Endowment Fund.	
£585 3½ per cent. Funding Stock 1999/2004	575
Fred Cook Memorial Lecture Fund.	
£1,008 3½ per cent. Funding Stock 1999/2004	1,000
	£30,079

TRUST INCOME AND EXPENDITURE

for the year ended 31st December, 1954

	Unexpended Income 1st Jan. 1954.	Income received during year.	Expenditure on lectures, prizes and administration.	Amount applied to Society's General Purposes.	Unexpended Income carried forward 31st Dec. 1954.
	£	£	£	£	£
Dr. Aldred Trust	17	3	5	—	15
Art Congress Studentship	175	40	54	—	161
R. B. Bennett Empire Prize Trust	92	45	2	—	135
Sir George Birdwood Memorial Fund	145	13	1	—	157
Selwyn Brinton Trust...	230	30	1	—	259
Alfred Davies Bequest	—	61	—	61	—
Le Neve Foster Trust	17	12	25	—	4
John Fothergill Trust	87	5	25	—	67
Thomas Gray Memorial Trust	202	361	480	—	83
Howard Trust	153	15	1	—	167
Owen Jones Memorial Trust	88	14	1	—	101
Neil Matheson McWharrie Trust	*Dr.* 5	11	1	—	5
Dr. Mann Trust	*Dr.* 20	18	31	—	*Dr.* 33
Mulready Trust	14	2	—	2	14
North London Exhibition Trust	87	5	—	—	92
Sir William J. Pope Memorial Fund	20	11	1	—	30
Russian Embassy Prize	54	2	5	—	51
Benjamin Shaw Trust	11	2	1	—	12
John Stock Trust	49	1	—	—	50
Dr. Swiney's Bequest	200	244	202	202	40
Trueman Wood Lecture Endowment Fund ...	10	32	33	—	9
Cadman Memorial Fund	30	9	1	—	38
Thomas Holland Trust	14	15	—	—	29
E. Frankland Armstrong Trust	39	16	25	—	30
Joseph Paxton Memorial Trust	65	46	—	—	111
A. C. Bossom Lecture Endowment Fund	20	15	15	—	20
	1,819	£1,028	£910	£265	1,680
	Dr. 25	—	—	—	*Dr.* 33
	£1,794				£1,647

PRESERVATION OF ANCIENT COTTAGES FUND. INCOME AND EXPENDITURE ACCOUNT for the year ended 31st December, 1954

1953			1954		1953
£		£	£		£
10	Insurance, etc.	9	30	Interest on Investments	30
351	Repairs to National Trust Cottages at Chiddingstone, Kent	639	28	Rents receivable	28
			584	Excess of Expenditure over Income transferred to Capital Account	286
£361		£648	£648		£361

BALANCE SHEET, 31st December, 1954

1953					1954		1953
£		£	£	£	£	£	£
	Capital Account—						
3,249	Balance at 31st December, 1953...			2,963			
	Deduct : Excess of Expenditure over Income as above ...	584					
286							
—	Loss on sale of investments ...	32					
—	Capital Redemption of Land Tax	32					
286			—	648			
2,963	Balance at 31st December, 1954 (including James Cranstoun Bequest £2,180)			2,315			
	PETER A. LE NEVE FOSTER } *Treasurers.*						
	ALFRED BOSSOM }						
£2,963				£2,315		£2,315	£2,963
					Cottages at Drayton St. Leonard (James Cranstoun Bequest) as fixed in 1932	1,000	1,000
					£600 3% Savings Bonds, 1955/65 at cost	—	500
					£132 3% Savings Bonds 1960/70 at cost	—	132
					£556 Agricultural Mortgage Corporation Ltd. 4½% Debenture Stock, 1961/91, (James Cranstoun Bequest) at cost	541	541
					£55 Hampstead Garden Suburb Trust Ltd., 5½% Debenture Stock at par value	—	55
						541	1,228
					(Market Value £565—1953 £1,225)		
					Debtors :		
					Royal Society of Arts ...	13	612
					Income Tax recoverable, etc.	14	14
						27	
					Balance with Bankers	747	109
						£2,315	£2,963

Report of the Auditors to the Council and Fellows of the Royal Society of Arts.

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. In our opinion proper books of account have been kept by the Fund so far as appears from our examination of those books. We have examined the above Balance Sheet and Income and Expenditure Account which are in agreement with the books of account. In our opinion and to the best of our information and according to the explanations given us the Balance Sheet gives a true and fair view of the state of the Fund's affairs as at 31st December, 1954 and the Income and Expenditure Account gives a true and fair view of the income and expenditure for the year ended on that date.

5, London Wall Buildings,
London, E.C.2.

17th June, 1955.

DELOITTE, PLENDER, GRIFFITHS & CO., *Auditors.*
Chartered Accountants.

THE ART OF THE MODERN MEDAL

A paper by

C. H. V. SUTHERLAND, M.A., D.Litt.,

Deputy Keeper of Coins, Ashmolean Museum, Oxford,

read to the Society on the occasion of the opening of the Exhibition of European Medals, 1930–1955, on Wednesday, 8th June, 1955, with Professor A. E. Richardson, President, Royal Academy of Arts, and a Member of Council of the Society, in the Chair

THE CHAIRMAN: This afternoon, we are to listen to one of the most interesting papers we could have on the subject of medals, which is to be given by Dr. Sutherland, Deputy Keeper of Coins at the Ashmolean Museum, Oxford.

I shall not make any comment on the subject at this stage. I think it is very wrong indeed for a chairman to do anything of that kind, but, on the conclusion of the paper, I propose to sum up.

It gives me very great pleasure, Dr. Sutherland, to ask you to deliver your paper.

The following paper, which was illustrated with lantern slides, was then read:

THE PAPER

The Royal Society of Arts has, with characteristic originality and imagination, arranged at the Society's house an exhibition of medals made in the last 25 years in Western Europe. It will make considerable demands upon us. Most obviously, it imposes the obligation of thanks. No such exhibition, so far as I am aware, has been held in this country for very many years—perhaps, indeed, not in living memory. It is true that occasionally we see medals exhibited. A selection of designs—small though none the less welcome—appears, for example, at the Royal Academy's summer exhibition at this moment. And there is generally some medallic work included in exhibitions of sculpture. But on the whole, in England at least, when medals have been given a place in artistic exhibitions in the past quarter of a century—or even more—they have been shown in numbers so small as to be hardly significant and have been admitted, so to speak, by the back stairs, as an inferior relation of other forms of artistic expression. For this reason the present opportunity of observing the art of contemporary medals purely in its own context is one for which we should and do feel warmly grateful.

The second demand made upon us follows immediately and logically. The medal is an art-form which is essentially unfamiliar in this country. It provides a field of design which is extremely small in comparison with the increasingly massive creations which are being made in so many other branches of human creativeness—whether we consider the vast monolithic trend of commercial architecture, or the large forms of much contemporary sculpture, or even the immense and majestic sweep of a really complex and up-to-date road system.

We must not only watch, attentively, to see just what it is that a good medal can express. We must also remember that, in a physical medium which is so strictly limited in size, skill and poetry and subtlety and beauty may entirely escape us if we do not observe the close and minute intimacy of what the artist has put there for us to see. Medallic art, though it can indeed assault the eye, will seldom do so as harshly as is done by the more massive or violent forms in architecture, free sculpture and painting. Its quality—good or bad, strong or weak, poetical or vapid—must be sought out in its quieter relationship with the eye and mind of the observer. It is, as I think, in the personal and solitary exercise of such criticism within a very small art-form that the true enjoyment of medals can be cultivated and found.

We accept it, of course, as a commonplace that medals of superb beauty and skill were produced in the past. Few people, at one time or another, have not paused for a moment over the achievements of famous designers in previous centuries—the Greek masters who produced coins of medal-like quality and purpose; their Roman counterparts, who produced so noble a series of ceremonial medallions; Pisanello, that swiftly rising and brilliant star on the horizon of the Italian Renaissance, who recreated medallic art with unsurpassed skill and loveliness; and those who have carried on the tradition from his day, many of them much more than averagely good, and some of them men of fully corresponding genius. The long development of medallic art in the past is the theme which M. Jean Babelon of Paris will pursue here in three weeks' time, with all the subtle interpretation and fluent appreciation of style for which he and his country are so well known. If it is I who am now dealing with medals of the present age, it is certainly not because I can make any slightest claim to superior knowledge of what this age has produced. It is rather because I have become conscious of the degree to which appreciation of the medal has, in Britain, come to lag behind appreciation of the other arts. Indeed, a considerable lead has been built up by the continent of Europe, where medals have never ceased to be regarded as things which, however small, are none the less rich in æsthetic pleasure and the highest technical skill.

What, then, can the medal give us by way of pleasure? Its possibilities, and indeed its function, must be distinguished, at the very outset, from those of coinage. Coinage is a social art in the fullest and most public sense, as Greek cities recognized 2,500 years ago in their efforts to secure the best artists for coinage which, if well designed, reflected credit on the peoples which issued them. Medals, on the other hand, are essentially personal or private. Coinage has to be produced in vast quantity, with its attendant technical problems. A medal, however, may be restricted to a mere handful of examples. Coinage must assume a form which, while suitable for mass-production, permits of long circulation without undue wear or defacement. Medals, by contrast, can show all the elaboration of detail, all the height of relief, which for modern coinage is quite impossible. In only one branch of medallic work do the conditions of production come at all close to those of coinage, namely, medals made as service-awards, for these, by definition, have to be manufactured in very large numbers. And,

curiously enough, it was fairly recently pleaded in a court case concerning the copyright of a medal that the word 'medal' at the present day implies only a service-award and nothing more. The learned judge, after reference to the *Oxford Dictionary*, had no difficulty in deciding otherwise, and the exhibition downstairs may be viewed as a detailed confirmation of his view. Medals, indeed, are infinitely varied in form and purpose. As we can see, they may strike a factual note in their frequent preoccupation with historical or commemorative themes or as portrait studies; while on the abstract or poetical side they may be allusive or allegorical, or æsthetic essays in pure design.

The exact category into which a medal falls may, of course, radically affect its technique. All I suppose, except the worst artists, do their best work when they are not starving in garrets; and an artist, if he is not to starve, must sell what he creates. Normally the medallic artist can sell, relatively cheaply, whatever he produces in greater numbers: conversely, each example of a limited edition will cost more money to make and will be slower to sell. Probably the greatest difficulty which the medallist faces is that of making contact with the public at all. Abroad, that difficulty is perhaps not so acute, for, as I have already said, medallic art has always been more familiar on the continent and, in addition, many countries of western Europe contain firms which not only manufacture medals—that is to say, strike or cast what the artist prepares as a model—but also concern themselves actively with the publishing of what they make. Here at home, however, the position is somewhat different. The medal, after being an art-form much sought after from the seventeenth to the nineteenth century, has lost popularity. At no time was this clearer than at the time of the Queen's Coronation, when the pottery makers so easily captured a market in keepsakes which in former generations would have been held firmly by the medallists. If people to-day wish to collect contemporary medals—or, for that matter, to have them made by private commission—they scarcely know where to go for them. And finally—and, in my own view, often very unjustly—some contemporary medals made in this country are subject still to the burden of a purchase tax which ought not, surely, to affect a serious work of art.

However, there is one branch of medallic art in which the link between the artist and the public is easier and more fruitful. Or rather, I should say, the link between the artist and his patrons; for when a medallist accepts a commission to make a portrait-medal he is working directly for his sitter or for those who wish to make a presentation to the sitter. The art of the portrait-medal to-day has reached remarkably high standards, and very many such medals are made. This is natural enough, too, in an age which so often finds it more convenient to house a medal than a large painted canvas, and which is happily content to pay for a first-class medallic portrait a price which compares so favourably with that of a first-class painted portrait—a price, moreover, which allows the distribution of examples to friends exactly as was done by the patrons for whom Pisanello and his followers worked in Renaissance Italy.

In the long run, as I said, the cost of a medal is largely dictated by the means of production. A medallist has a clear choice before him. He can have his medals

either cast or struck. The method of casting is that in which Pisanello himself excelled, and which many medallic artists of our own day—in Italy and France especially, as you will see—turn to such admirable account when the circumstances permit it. And what are these circumstances? First, the obligation to produce only relatively few exemplars: secondly, the means of getting the casting-process carried out with all the skill it demands. The general process is familiar enough in its simple outlines. The artist models his design in wax or clay, giving to it everything which he can devise by way of subtlety of detail, variation of surface texture, and height and variety of relief. From his completed model a mould is made; and from the mould the medal is cast direct. The artist may not be satisfied. Very well: he returns to his original model, which he corrects, modifies or elaborates in the light of the specimen just cast; a new mould is prepared, and the medal is cast afresh in its modified form. By this technique there is obtained what is probably the highest medallic perfection. For, in the first place (and I shall not fail to return to this point again), the medal is finally made in the size in which it was designed. Secondly, just as the artist enjoyed, in his wax or clay model, the whole range of differing surface-textures, varying from the smoothness of skin to the roughness of hair or material, so too we can enjoy the same range of texture in the cast metal. For cast metal 'settles' with a sensitivity not found when metal is violently constricted in the coining press, and thus it holds both light and shadow with a gentleness of gradation and a total absence of harsh contrast. Nevertheless, we must pay for our pleasure. Not all artists now care to cast their own medals, though the Italian exhibits here show that, in Italy above all, this special skill is very much alive. Often, however, the work must be put out to specialized craftsmen and, as only comparatively few specimens can be cast from a given mould, the cost of each specimen must clearly be the higher in proportion.

And so the cast medal must compete with its struck counterpart, and in Britain at least most contemporary medals are still struck under pressure from dies. Here the process is exactly comparable with that of coining. Again, the artist prepares his wax or clay model. In this case, however, he will now usually work in a size larger than that of the finished product, for, when his model is completed, a plaster cast will be taken from it and this cast, when metallized on its surface, will then be subjected to the reducing machine, which in turn will automatically make a copy—exactly as is done for our coinage—of the required size. From this copy, hard metal dies are prepared, and these dies can then strike numerous examples of the medal under pressure.

It is obvious that, in the case of many medals required in large numbers—and official medals above all, the striking process must be preferred, for a die-struck medal can be produced in far greater numbers, and at greater speed, than a cast medal, and at a much lower cost per medal. But it is right to ask if we have not come to rely too easily on the die-struck technique. In the first place, though many designs lend themselves very well to this technique, equally certainly others do not. The essence of a struck medal is the hardness or brightness of its surface—the effect of the crystallization of metal under pressure. Thus

a model which is all tenderness, all gentleness of texture, all subtlety of light and shade, is translated into a hard, bright and often unsubtle version. Then again the mere fact of adopting a process in which metal is violently constricted and brutally forced to conform to the pattern of a die will mean that there are severe technical limitations set upon the artist himself. He cannot design simply at will. He must always consider to what extent he should provide for the pressure-flow of metal in relation to the height of his relief. This is amply demonstrated by the history of European medals after machinery for striking became universal. Invented in Italy at the time of the Renaissance itself, elaborated in Germany, and perfected in France by the seventeenth century, machinery very conspicuously affected the development of medallic art. It at once lowered relief, and it regularized lay-out of design. Indeed, the free development of the art of the medal was dealt a permanent injury by the introduction of machinery.

Yet this is not all. For the last century and a quarter medallic art—together with that of coinage as well—has had to face a new mechanical device. Even in the case of medals which are well suited in design and character for die-striking as opposed to casting, this device comes all too near, as I think, to destroying or at least diluting the artist's personal touch on the finished product. It consists of the reducing-machine—a French invention of the late eighteenth century which, after being introduced into England in the early nineteenth century, has since been in standard use, in much improved form, in most countries. With this machine to fall back on, an artist who wishes to make a design for a die-struck medal no longer needs—as he always previously needed—to be an engraver of high skill, capable of cutting his design into hard metal dies as was done, for example, for virtually every single one of the innumerable coins made from early Greek days down to the seventeenth century. Instead he can work as a sculptor—and here, of course, he is doing what the maker of a cast metal would do; for he models his design in relief in wax or clay, though generally and for convenience, in a size very considerably larger than that of the medal which is to bear it. At this point the similarity of method with the cast medal ceases. With the cast medal, as we have seen, once the relief model is complete, a mould is made from it and the medal is cast direct from the mould. But the modern designer of a large-scale relief model for a die-struck medal makes, first, a (negative) plaster mould of his design; secondly, makes a positive plaster cast from this mould; thirdly, submits this cast, with its surface metallized and hard, to the reducing-machine, which, fourth, automatically reproduces a metal replica in small size; fifth, this small replica—a positive—is used to punch out the final negative die; and, sixth, the positive medal is struck from this die.

Here are six stages of processing, as against the three of the cast medal. Is it to be wondered at that critics, who have seen an artist's original design in the wax or clay, should sometimes feel that its characteristics are weakened or impaired by this long and complex mechanical transmutation? Moreover, in this transmutation there has been a significant change of size. I candidly recognize the practical arguments in favour of the reducing machine. Yet I think that it does as much harm as good—and very likely more. I know that it enables the

art of the sculptor to come to the rescue, in medal-making, of the dwindling band of those who could carve their dies direct in the metal. I know that, in the case of coinage, great economy of public funds is permitted when a single design—for instance, Mrs. Gillick's majestic and yet tender coin-portrait of the Queen—can be fed to the machine for translation into many different sizes at will. Yet I am equally certain that a design is always at its best if it is reproduced in the size in which it was first made, and—if I may cite Mrs. Gillick's portrait again—I would point to that as the hundred per cent work of which reduction passes on no more than fifty per cent. I am far from being alone in this conviction. The late Sir George Hill, who combined a profound technical knowledge with the most fastidious critical taste in the judgment of medals, pointed out repeatedly that no design can be reduced in size without endangering its internal relationships and proportions. He remarked that neither modelling nor design can be truly translated on to a smaller scale except by an intelligent hand, and that a reduction is about as true to model as a cheap colour-process illustration is to the original painting. The great French medallist Henri Dropsy adds his own authority to the view. He concedes, of course, the benefit felt by the artist in not requiring mastery of the difficult art of the engraver. Then he continues: 'Medallists have become accustomed to making their models not in the size of the intended medal but on a larger scale, and in doing so they have lost the true feeling for proportion and absolute values. Relief and detail which look well on a model of thirty or forty centimetres wide are not amenable when the machine reduces them to eight or ten. Pisanello', he continues, 'who created the plastic medal and made it perfect, modelled his works in their actual size', and he concludes by urging that medallists should make their designs in the size in which they are to be reproduced: they *must*, he says, be masters of the machine which can serve them so well—or so ill.

So much, then, by way of brief comment on the technical factors that affect an artist's inherent skill in design and his ability to reach a market. Let his design be as good as you will, he is ultimately dependent—in reaching his potential purchasers—on the processing methods of other people, whether in casting or die-making. In Britain, as in some countries abroad, such processing will frequently be carried out at the national mint, where a full range of mechanical contrivances is to be found and high standards of technique are always to be relied on. We must be grateful to the Royal Mint in London for the technical services which it offers to the medallist. And we must indeed remember all that the Royal Mint does to multiply employment for medallists. Yet we should perhaps ask, too, that the Royal Mint should be ready to give an artist the freest possible hand, compatible with technical problems, in making designs: many of its products, of course, are official governmental products, officially and governmentally commissioned, and designs for these must naturally run the gauntlet of the official advisory committee. But one must plead that the work of this committee should be kept at a minimum. Experience does not often suggest, in any field, that a committee can get the best out of an artist; and though such a committee must obviously exist I should be glad to know that its operations

were most strictly confined to guidance and selection of official medals only, and I should hope that it would always deprecate the giving of advice on non-official medals commissioned by bodies other than the Royal Mint itself. The Royal Mint—subject only to considerations of technique—should in such cases be content to act simply as a manufacturer, and not in any automatic sense as an official arbiter of design.

If I were asked to reflect on the medals of western Europe made in the last quarter of a century—and I should deliberately exclude those of which the theme and impulse are primarily drawn from warfare—I should lay emphasis on three things. First, and probably most welcome, the growth of the purely imaginative and poetical quality in design and composition—sometimes conveyed a little brutally by means of deliberate distortion, but in nearly all cases the result of deep emotion, penetrating insight, and the ability to use a few sharply significant elements as symbols of the whole range of human experience. Secondly, the remarkable advance made in the technique of sensitive human portraiture. Thirdly, the increasing realization of the need for harmony in subject and style between the two sides of a double-sided medal. In showing some few examples of these points I have to confine myself to relatively few works by relatively few artists; and if I illustrate medals from France, Italy, Holland and Britain alone it is not because there is not a far wider choice, as the exhibition here shows. Some of the medals which I propose to illustrate can be seen in the exhibition itself: others are not there shown. My choice is essentially a personal and a random choice; and in omitting the works of many countries fertile in medallic art I must not be thought to be slighting them in the least degree. Indeed, if our exhibition went further afield for its material and included medals from America, one could not exclude that great master Theodore Spicer-Simson.

Let me first give some examples of medals that seem to me to be admirable in their sense of composition emotionally conceived, dramatically presented, and yet rigorously controlled. The small field of a medal is isolated in space. It has no setting apart from that which the artist, by his skill, can give it. There is no frame to enclose it: no wall, still and timeless, to hang it on and set it off: no architectural ensemble in which it can play any significant part. It must be self-sufficient. Its ability to satisfy will come from the most rigorous exercise of the laws of proportion and balance, coloured—if I may use the phrase for a medium in which colour has no place apart from the tone of the metal itself—by the artist's depth of feeling and sense of poetry. For a simple and admirably effective example of the way in which a clever artist can contrive to limit a design which is in theory unlimitable, we can look at the lovely and moving medal which Jan Pieters of Holland made to commemorate the final closing of the Dutch dykes in November, 1953. Here, on one side of this piece—which, we note, is cast and not struck, and cast with a deliberately uneven circumference at that—the sea pours in, a direct relentless flood, over the edge of what is, in appalling reality, the coast of Holland, surrounding and submerging the lonely roof which so clearly symbolizes the isolated farms in the sunken meadows of North Holland. Nothing is to be seen but water swirling round that roof: of

life there is no sign. On the other side a dyke has arisen around the edge of the medal; and painfully, stiffly, men labour to seal the last breach, driving out the dreaded water over the edge of the medal—over the edge of Holland. These designs, of course, constitute a *tour de force*, for the artist has used his medallic space as the symbol of a much greater space, and of a much greater and more laborious time, than the medal itself can enjoy in its own limited space and single moment of time; and by this achievement, combined with a superb sense of composition, he has secured consummate mastery.

Yet the art of composition need not be so elaborate, stealing so much by symbolism from space and time. A successful design may be classic in its simplicity—a matter of poised and balancing masses. Paul Vincze of England excels in the composition of single figures sculpturally treated, and rendered with all the variety of relief of which a true sculptor is capable. In such studies as his allegorical kneeling figure there is no temptation, as in the Pieters medal, to look beyond the medal's own confines. Balance—and satisfaction—comes from the relationship between the uncompromising circular outline of the medal itself and the fluid curves of the cruciform pattern of the figure which it encloses—a figure which, with its rhythmical lines, imparts motion and strength and rhythm to what would otherwise be a circle of deadly immobility. While Pieters used the irregular size of his medal as a horizon—on one side breached, on the other secure and strong—Vincze makes his circular outline contribute to, and reflect, the violent movement, temporarily arrested, of the contorted figure which it encloses. Excellent Italian examples of multiple-figure stress and balance, fitting with perfect aptitude into a circular compass, are seen in Verginelli's *Annunciation* and Pirrone's charming *Fai presto, arrivano*.

A third artist, André Galtié, of France, supplies admirable examples of dramatic power in emotional but rigorously balanced composition. His medal of Antoine de St. Exupéry is a model of contrasted moods. On one side, an aeroplane propeller—buckled, ruinous blades of twisted metal lying unevenly on a circular field, the useless claws grabbing at an extent of rough and muddy space in which a single flower blooms. On the other side, the heavenly firmament and the trail which soars, eagle-like in spirit, through stars and clouds. Neither side possesses any formal border: in each the moment of experience is universalized, the one set against the world's timelessness, the other against the vastness of the sky above the earth. Galtié, indeed, is a master in the art of symbolizing pathos in a medal's small field, as is shown also by his *Péri en mer*. Here, on the one side, the sailor sinks drowning into the deep abyss which cruelly cleaves open for him, lashing wildly with his hands, and thrashing with his feet, dimly seen, that simply serve to underline, and in fact to outline, the terrible shape of the water around him. On the other side the formal mourning woman weeps, separated by a cross from the ghost of her dead, drowned man. In these two designs the central subject is in each case cut off from all other space around it by a narrow border, in low relief, decorated with a simple cross-hatching which emphasizes the isolation of desperation and agony.

Here then are random examples of composition which illustrate variously

enough—some with pathetic emphasis, some with an uncanny power of spatial imagination, some with rigorous purity of line—the purposes to which the little field of a medal may be turned by a skilled and sensitive artist. The problems of portraiture are very different, and the limitations are very severe. Like a painter, the portrait-medallist has to immobilize what is one of the most mobile of all objects—the human face; and although the medallist can work in the three-dimensional forms of the solid, as against the two dimensions of the painter, he is without the aid of colour, and thus, from the very first, imposes a stringent demand upon those who are required to view a portrait in the tones of gold or silver or bronze. Yet the metal brings its own reward. Swelling from one plane of relief to another, and subtly varied by the play of light and shade, a medallic portrait can enjoy mobility and vivacity. This feeling of life can be felt more or less intimately according as the portrait is rendered fully facing or in profile. For the moment I shall concentrate on profiles, and I shall point out, what M. Babelon eloquently expounded a few years ago, that a profile portrait enjoys a potency in some ways all the greater because there is no eye-to-eye contact whatever between the observer and the observed. We can searchingly examine a profile portrait in complete emotional isolation: the experience is not complicated by visual eye-to-eye intimacy in which souls are revealed so fully as to affect judgment or sway reason. Such, for example, are the portraits of Jean Cocteau by Mme. Josette Coeffin and of E. S. G. Robinson by Paul Vincze. In each the treatment is dry. In each the artist has played with the lines and little furrows which, cleverly understood, so brilliantly suggest the momentary constriction of muscle over bone and the imminence of movement. In each, the subject has entered the medal's field, in strict profile, confidently alert and aloof, submitting to be analyzed with an easy grace during that fraction of time in which immobility is preserved.

This same sense of remoteness, momentary but absolute, is of course to be seen also in the portraits of reigning sovereigns, in which a deeper symbolism, partly religious and partly ceremonial, contributes to the indefinable sense of majesty. We may compare two studies of our Queen. One of these—the portrait evolved by Mrs. Gillick in connection with the new coinage and exhibited in one form downstairs—started strictly as a medallic design, in a size very considerably larger than that to which machinery afterwards reduced it. This portrait, as beautifully executed as it was beautifully conceived, is all grace. The forms are slender, yet, placed high upon the column of the neck, secure with poised strength. The mood is simple, but none the less serious. Hair and drapery are lightly rendered, enabling shadow to be concentrated significantly round eye and mouth and chin, where they properly belong. This portrait, of course, was modelled from the life, and yet Mrs. Gillick contrived to make a representation which, though true to life, speaks quite as much (though in profile) of the spirit as of the features themselves. The other portrait of the Queen, also shown to-day, was a French compliment and courtesy on the occasion of the Coronation. It is the work of Henri Dropsy, and in many essentials it spells the same story of grace, youth, and seriousness. But it is—and there

was no reason why it should not be—a much more personalized study. The head is inclined backwards, though infinitesimally, upon a neck that leans very slightly forward, and the shoulder is bare. And because the artist has shown the Queen turned fractionally towards us we can just see the further eyelash and can feel, from the generous treatment of mouth and chin, that the head could at any moment turn slightly towards us.

From the subtle yet exciting and exacting remoteness of the profile portrait to the violent intimacy of the facing portrait is a long step. But it is a wonderful step when it is made by a master of medallic art. André Galtié's superb portrait of Toulouse-Lautrec—exhibited in the Society's Exhibition of European Medals, 1930–1955—is entirely satisfying. We see Toulouse-Lautrec in isolation, his features bounded, in a flash of brilliant inspiration, by the wide brim of a great straw hat. The success of this unorthodox treatment is immediately clear, for the fascination of the features lies chiefly in the thick and curving lips, and in the eyes—heavy, retired, reflective, almost disdainful, over which only the merest hint of rimless pince-nez is allowed: and these elements would have been almost totally obscured, or even lost, by profile treatment. Judged by any standard, this is a portrait of astonishing ingenuity and power: its ability to satisfy is outstanding.

The third of the elements which I singled out for comment a little while ago was harmony between the two sides of a double-sided medal—a close integration of the ideas and style of the designs which are placed back to back. Just as Pieters made the flood flow and ebb, so too St. Exupéry's earthbound mortality was linked by Galtié to his starry career in the air. The necessity to integrate both sides of a medal—or, for that matter, both sides of a coin—is something which, all too often, is insufficiently felt or understood, even to the point of allowing designs by two different artists to be combined back to back, with results that are just occasionally satisfactory (as when two artists habitually work in close association) but much more often quite lamentable. A two-sided medal should speak with a single voice: indeed, the best of Greek and Roman coinage centuries ago defined this same principle with absolute clarity. And there are medallists working to-day, as we have seen, who take good care that the symbolism and style of one side is fully consonant with that of the other, each side amplifying and complementing the message of the other. Equally there are many medallists—and the Italian exhibits here to-day make the point well—who wisely prefer a single-sided medal to a double-sided one which risks a lack of essential harmony. If I may give one more example of this deeply important quality in two-sided medals I should point to the medals of Raymond Corbin of France. Take, for example, a medal which you can see downstairs, of Colette, or—perhaps a stronger example still—his medal of Léon-Paul Fargue. In each of these a fluidly impressionist yet strongly felt and strongly rendered portrait is paired with a townscape or landscape which, partly by its naturally brilliant composition, but partly also by its success in symbolizing things dear to the heart of Colette or Fargue, is an admirable foil to the portrait, rendered in the same admirable technique. These medals are so much more than a mere pair of designs:

they are a double commentary, subjective and objective, on those whom they portray.

Out of an immensely larger field of possibilities I have selected just a few pieces which seem to me to illustrate some of the deeply pleasing qualities in modern medallic art. If that art is to flourish as it has so often flourished in the past, certain conditions must probably be fulfilled. A closer contact of artists with the public—and a more appreciative public at that—must take place, so that medals may be commissioned directly from the artists themselves in as many cases as possible. And that is one reason why I am so pleased to see this exhibition take place. Then again artists themselves should very carefully consider the extent to which the casting of medals might be increased at the expense of the number of struck medals: the exhibition to-day shows well enough the medium to which artists abroad attach chief importance. Finally, the use of the reducing-machine should, in the case of struck medals, be kept at a minimum. Coins we must probably write off to some extent as being inevitably deficient in the major qualities which their original designs showed. But there is no reason in the world why a good medallist should not make his model either in its actual size or at least in a size in which reduction is a fractional rather than a major matter; and one might appeal to the world's great mints—and to the Royal Mint among them—to keep this monster under control when medals are being produced. For only so, in the long run, will medallic artists be encouraged to develop the skill and technique and imagination from which must come not only medals but—and we wish they could be changed more often—the designs for really good coinage as well.

DISCUSSION

THE CHAIRMAN: We have listened to a truly remarkable lecture, delivered to some of the greatest authorities on medals in Europe. I shall reserve my encomiums to the last. I think we are under a debt, I can say that now, to our lecturer. He has shown us what criticism should be—constructive; not mere words, but a description of the art and the process of medal production. That, of course, is the greatest gift of all.

Before I sum up, I will invite members of the audience to contribute very briefly their impressions, and thereby establish new contacts with the public.

MR. CECIL THOMAS, O.B.E.: I would like to congratulate the Royal Society of Arts on having this Exhibition. I think it is most likely to be what one might term a second turning point here in the medallic art in this century. I think the first was when the Royal Mint Advisory Committee was formed about 1920. If it had not been for that, medallic art in this country would have been in a very much poorer state than it is.

There is hope for the medallic art of the future for this reason: during thousands of years in which this art has been practised, it has always been done by miniature workers. That is, those skilled in miniature art. Since the turn of the century that has changed, and the sculptor has made the larger models for reduction by machine. But the new casting processes, by centrifugal and air pressure casting, make it possible that the miniature worker of the future will have an opportunity of modelling and working metals in minute size, and getting a result by this process of casting that will probably restore the miniature three-dimensional art. I hope it will open the

field for invention in design which obviously, from the pictures that he showed, Dr. Sutherland so warmly advocates.

MR. H. V. RADCLIFFE: Could Dr. Sutherland make any comment on the changing use of materials?

THE LECTURER: For certain uses, gold and silver are obviously splendid. For normal purposes, both gold and silver reflect too much light to be comfortable, much more than is reflected by what is conventionally called 'bronze'. A bronze alloy of whatever kind, and I am no metallurgist, is usually most satisfactory because it gives that slight dullness which absorbs excess light and allows the true delicacy and subtlety of design to be best seen.

As for the particular advantages of one alloy over another, I must confess to complete ignorance, though undoubtedly we are in a building where those mysteries could be easily unravelled by those who are entirely familiar with that sort of point.

THE CHAIRMAN: I think the remarks made by Dr. Sutherland are exemplified in a coin which everybody has in their pockets at this moment: the penny. On that penny which the Romans bequeathed to us and which has survived all changes, the sea and the sky are not limited, while the figure of Britannia is dominant. Our lecturer has told us to-day, and has shown us by these examples, that Hellenic art of coinage is being reborn, although the metallic content has been exchanged by, for example, the abolition of the gold standard. I have been informed by the Deputy Master of the Mint that apprentices are still encouraged to produce the sovereign in anticipation. That is excellent news, because the production and design of medals is related to the coinage, and a country is judged by its coinage and by its medals: with all due respect to my own country, France leads us in the design of medals, as she has done since the eighteenth century. We are now following close behind, and we are profiting from those lessons offered by France.

Before I decided to accept the position of Chairman this afternoon, I went through my coin box, and I began by studying the Roman *As*, the antique equivalent to our penny. I continued through the collection, and I noticed the wonderful modelling, and then I came to a magnificent cast medal of Newton by John Croke, cast when he was appointed Master of the Mint.

We need more interest in medals. They are, as one speaker has said this afternoon, art in miniature, just as water-colour painting is a miniature art, also cutting of ivory, and models of sculpture in miniature. Medal design is really most important. Compare it, as Dr. Sutherland mentioned, with the crushing expression of architecture to-day.

The public, especially those with seeing eyes, are no longer deceived by labour-saving devices. Just think of the stark expression of architecture, and compare it with the delicate interpretation of portraiture by medallists, and of the great contrasts that there have been there too. Perversions are almost impossible in the design of medals. This is why we are returning to the Hellenic in medallic form.

All medals should be rich in effect. Why should we go on submitting to the taxation of works of art? Do you think we shall continue to get real works of art while artists starve? And when artists do produce superb works for which they are underpaid, they then have to pay purchase tax, or rather the public do. It is ridiculous, this socialistic tyranny of the purchase tax—abandon it at once! This is a strong recommendation to this new Government. All the riches and all the prizes should be lavished on artists, just to encourage them, not to suppress them, but it is a particularly British trait to tax the designers heavily.

Then we have the harmful influence of machinery. Of course medals have to be struck, but the finest medals are those which are first cast and then refined.

J. H. COEFFIN (France)
Jean Cocteau. 68 mm

ANDRÉ CALTIÉ (France)
Toulouse-Lautrec. 100 mm

VICTOR G. GIL (Spain)
Grabador. 57 mm

MARY GILLICK (Great Britain)
Royal Tour. 38 mm

L. J. PIETERS (Holland)
Repairs to the Dykes; obverse and reverse. 108 mm

GIUSEPPE PIRRONE (Italy)
Fai presto, arrivano. 100 mm

PAUL VINCZE (Great Britain)
E. S. G. Robinson. 50 mm

Dr. Sutherland describes the six stages of processing. We have listened with interest to this part of his lecture, first the drawing of the design and getting it through a committee, then the preparation of various models, followed by the reduction to the actual size. The French were very ingenious when they invented the reducing machine in the eighteenth century, but I have some of the large medals of Napoleon by Andrieu before they were reduced.

We sometimes forget that the interest in medals began in England. It was Addison in *The Spectator* who wrote dialogues on the medal. Refer to the original Baskerville editions of Addison's works, and enjoy these essays. When you are half way through you will notice some verses on medals by Pope:

> The Medal, faithful to its charge of fame,
> Thro' climes and ages bears each form and name:
> In one short view, subjected to our eye,
> Gods, Emperors, Heroes, Sages, Beauties lye.
> With sharpened sight pale Antiquaries pore,
> The inscription value, but the rust adore,
> This, the Blue varnish, that, the Green endears,
> The sacred rust, of twice ten hundred years.

That was the way the early eighteenth century people regarded medals, but that did not deter them from going to Rome and getting all the medals they could to form the great collections that you, Dr. Sutherland, have charge of at Oxford. We lost this appreciation when we debased the coinage.

You have referred, Dr. Sutherland, to the Government as being the greatest patron of the day. But let the Government beware! Let it not usurp the position of the artists. The artist is the true dictator and arbiter of taste, and the Government merely the patron. There is still the need to give artists encouragement. Why not use the Royal Academy as the centre for judging? There are very fine artists and engravers there. Why not submit designs for medals to them for advice? You have this great national academy. Why not use it. Go to the proper authorities. Consult the engravers and the sculptors. They are men of taste and experience.

Dr. Sutherland advocates poetic conception. Quite right. Imagination is needed, but always within the constant frame of experience. It is no good just saying 'be original', there is no such thing as originality. There is, however, infinite variation. When I hear people talking about originality I listen in silence.

Dr. Sutherland has shown us that the medal can be a thing of beauty, whether it is employed for portraiture, for symbolism, or for recording national events. I have the greatest pleasure, on behalf of the Council of the Royal Society of Arts, in thanking him for his lecture.

A vote of thanks to the Lecturer was carried with acclamation.

SIR ERNEST GOODALE, C.B.E., M.C. (A Vice-President of the Society): It falls to me, as Chairman of the Exhibition's Organizing Committee, to thank you, Mr. Chairman, for presiding. But before I do so, I would like to make just one or two remarks upon the past activities of the Society, because I think it is important that it should be made clear this afternoon that the improvement of the design of medals is not a subject in which the Royal Society of Arts has taken a practical interest for the first time only this year. In 1758, almost 200 years ago, it decided to include the subject in its scheme of annual prize competitions, and it is interesting to note that, in announcing the prizes which it then offered, the Society stated that the medallic art was capable of great improvement in this country.

A prize was offered for a number of years, and several times members of the family of Thomas Pingo, the well-known engraver to the Mint, were successful. In

some years the Society set the subject for the medals, and fortunately at this period our armies both in Canada and in India provided, by their victories, some admirable themes for commemorative medals. I mention this because, in the specially contributed article in *The Times* to-day, the President of the Royal Numismatic Society commented on the opportunity of warlike themes for commemorative medals. About fifty years later the Society revived its interest in this subject, and again offered prizes for medal design, in which various members of the Wyon family were successful. The Isis Medal by Thomas Wyon, Junior, and the Ceres Medal and Ordinary Medal of the Society by William Wyon*, are among those for which prizes were awarded during this period.

But there is one other practical example of the Society's interest in this subject which I must particularly mention. In April, 1760, the Society held in its rooms the first Exhibition of Contemporary Art in this country, and thereby it not only established a custom for these annual exhibitions which has been maintained in London without a break ever since, but it also led to the establishment of that great institution the Royal Academy, the head of which is honouring us by presiding this afternoon. Now it is interesting to note that medals were one of the classes of exhibits included in that first British Exhibition of Contemporary Art, among them being the Society's own first medal which was designed by Athenian Stuart and engraved by Thomas Pingo*. This exhibition of contemporary medals, therefore, is by no means a fresh event in this country. What we believe is new this afternoon is an exhibition consisting exclusively of medals.

I would like again, as Chairman of the Organizing Committee, to thank our friend Monsieur Arthus-Bertrand, the President of the Fédération Internationale des Éditeurs de Médailles, for without him the Exhibition would not have been possible. We are also most grateful for the invaluable assistance rendered by the Director of the Paris Mint, Monsieur Malécot, and of course by our own Sir Lionel Thompson, Deputy Keeper of the Royal Mint, who have lent us such remarkable exhibits.

It only remains for me to thank you, Professor Richardson, for presiding this afternoon. You have come here as President of the Royal Academy, but we also claim you as a Member of Council of our own Society. You have presided in your own inimitable way, if I may say so, and charmed us with your comments. Thank you very much indeed.

A vote of thanks to the Chairman was carried with acclamation and the meeting then ended.

* Included, as part of a special exhibit of the Society's medals, in the Exhibition of European Medals.

RECENT DEVELOPMENTS IN DEEP SEA DIVING

A paper by

SIR ROBERT H. DAVIS, D.Sc.,

Chairman, Messrs. Siebe, Gorman & Co., Ltd.,

read to the Society on Wednesday, 30th March, 1955, with Captain W. O. Shelford, R.N. (retired), late Superintendent of Diving, Royal Navy, in the Chair

THE CHAIRMAN: It is my very great privilege this afternoon to introduce our speaker, Sir Robert Davis. To anyone who has any sort of acquaintance with underwater affairs, Sir Robert's name must be so well known that I hardly need introduce him.

It does so happen that I have had experience of almost every known form of diving, so I can assure you that there is hardly any method by which man can live under water which does not owe something to the initiative of Sir Robert Davis. During the 73 years that he has been with his famous company he has most truly proved himself to be the moving spirit of deep sea diving.

The following paper, which was illustrated with lantern slides, was then read:

THE PAPER

In 1934 I had the honour to be asked to deliver to the Society a course of Thomas Gray lectures on '*Deep diving and underwater rescue*'. In those lectures I made a brief survey of the art of diving through the ages, recent deep diving developments, marine salvage, and rescue of men from disabled submarines. The length of the present paper will only allow me to summarize a few of the developments, and to describe briefly some of the new devices that have been introduced during the intervening twenty years.

Twenty years ago, the maximum depth at which divers had worked with safety in the flexible (that is, ordinary) diving dress using atmospheric air, and employing the late Professor John Scott Haldane's 'stage' method of decompression of the diver—as modified after considerable experiment in my Company's experimental department, and calculated by Captain G. C. C. Damant, C.B.E., R.N. (retired), who was then in charge of that section of our works—was 54 fathoms, that is, 324 feet, an increase of about 20 fathoms or 120 feet over Haldane's original maximum of 34 fathoms or 204 feet.

I mentioned in one of my earlier lectures that we had also been experimenting with helium and oxygen mixtures in place of ordinary atmospheric air (nitrogen and oxygen), and that the experiments were still proceeding, it being hoped that helium, an inert gas having greater diffusivity than nitrogen, would enable us to shorten the diver's decompression time required after a deep dive, but the

saving proved to be almost negligible. Helium, however, proved to be most efficacious in another and an unexpected direction.

It had been found in some cases, where the diver was working at a depth of between 260 and 300 feet on atmospheric air, that he behaved somewhat erratically. He appeared to suffer from a form of mental 'black-out', and would go aimlessly on, wandering, oblivious to further danger, perhaps into still deeper water and so adding to the seriousness of his condition. Investigation proved the cause of the trouble to be nitrogen narcosis, a form of unconscious behaviour due to breathing excess of nitrogen under high pressure, the victim, while retaining his locomotory faculties, lacking the mental power to control them. The Admiralty to-day normally limit flexible dress divers in the Navy to a depth of 240 feet when breathing atmospheric air; at greater depths helium-oxygen mixtures are substituted.

An outstanding performance by a diver of the Royal Navy, equipped with Siebe, Gorman & Co.'s flexible dress, and breathing a helium-oxygen mixture, was that of Petty Officer William Bollard who, in 1948, reached a depth of 90 fathoms, that is, 540 feet. This easily stands as a record in its class. It will be agreed, however, that, in view of the very long decompression needed, such a dive will not readily be repeated operationally. Only in case of urgent necessity, and in favourable conditions of weather and tide, can dives to these depths be undertaken. It should be mentioned that, for safety reasons, Bollard was given decompression for a longer and deeper dive than he actually performed. An interesting point about this dive on oxygen and helium is that, although only a short time was spent on the bottom, the diver at least retained his full faculties, a state which would not have been possible without helium. In actual fact, Bollard contracted a mild 'bend' during decompression, and the curative treatment adopted extended the total time for the ascent to over eight hours.

The following figures concerning Bollard's dive will, I think, be of interest as well as instructive:

Time for descent: 7½ minutes, which included a 2½-minute stop at 165 feet to change from breathing atmospheric air to breathing helium-oxygen mixture.

Time on sea bed: Five minutes.

Time for ascent (i.e. from sea-bed to normal atmospheric pressure): Total: 8 hours 26 minutes.

Percentage of breathing mixture: 11 per cent oxygen, 89 per cent helium.

Volume of mixture delivered to diver from beginning to end of dive: Approximately 1,000 cubic feet of free gas delivered through the injector at 0·69 cubic feet per minute.

The diver got on the short ladder of the Davis submersible decompression chamber at a depth of 190 feet, having had one stop of seven minutes at 240 feet and, retaining his helmet, but with his weights removed by the attendant, rested with his head inside the chamber. The reason for this procedure was that he had to continue breathing oxygen and helium from his air-line until reaching

sixty feet from the surface. During this period on the ladder, he carried out 14 stops totalling 1 hour 57 minutes. Shortage of helium, which is only obtainable from the United States, did not permit a sufficient supply of it to the chamber itself, otherwise Bollard would have got right into the chamber and been hauled inboard, and completed his decompression there in the normal way. I am told he was quite comfortable in this position, and, in fact, had a good sleep! At sixty feet, the depth at which he could start his pure oxygen breathing, he was brought fully into the chamber, which was then hoisted inboard in the diving ship. The breathing of pure oxygen in the later stages of decompression after a deep sea dive, hastens the expulsion of the excess of nitrogen, and so shortens the process.

FIGURE 1. *Davis submersible decompression chamber*

The last stop on oxy-helium diving is always a very long one (in this case 1 hour 53 minutes at 30 feet) and in order to give the diver some relief from the close confines of the submersible decompression chamber, during this tedious wait, he was transferred to the ship's static decompression chamber. This was done by blowing down the pressure in the submersible chamber from thirty feet to zero, quickly transferring the diver to the main chamber, and then recompressing him back to thirty feet. Bollard contracted a mild 'bend' in the arm whilst being blown down preparatory to transfer, and instead of being recompressed to only thirty feet, he had to be taken down to seventy feet, and the total decompression times were correspondingly prolonged.

Bollard experienced relief on being recompressed to the equivalent of 33 feet = 14·7 lb. per square inch but, in accordance with certain established practice, he was recompressed to 15 lb. per square inch beyond the 'relief' pressure, that is to say, to about 30 lb. per square inch. His stops after he entered the Davis submersible decompression chamber under water were as follows:

Breathing all oxygen

Feet:	60	50	40	30
Minutes:	3	19	25	13

And in the main chamber on board the salvage vessel *Reclaim*:

Breathing air			*Breathing oxygen*				
Feet:	70	60	Feet:	60	50	40	30
Minutes:	19	20	Minutes:	3	19	25	113

DIVING APPARATUS USED

The equipment was the Siebe, Gorman 'deep diving injector' system, and flexible suit, with the Davis six-bolt type helmet and dress, and air hose, with special couplings to withstand a total gas pressure of 300 lb. per square inch—all by the same firm. Gas was supplied through an American-type control panel kindly loaned by the United States Navy. The Davis submersible decompression chamber used was specially fitted to allow both diver and attendant to breathe oxygen during decompression, and was lowered to 190 feet to receive the diver at his second stop.

For cases where several divers were employed on deep water operations, I designed a three-compartment chamber, the middle one of which was fitted at its top with a door and a special connection made to receive a corresponding connection at the bottom of the submersible decompression chamber, so that the diver could be transferred from the S.D.C. to the static chamber without disturbing the diver's decompression sequence.

But these facilities were not available when the record dive was made, and, as described above, it was necessary to comedown to zero pressure for a short time to effect the transfer. Had the 'transfer-under-pressure' system been available, Bollard might not have got his 'bend'.

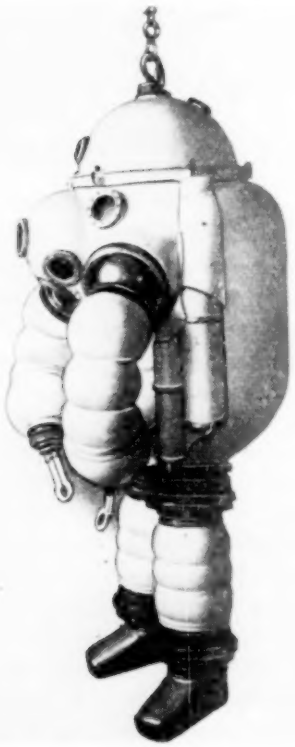

FIGURE 2. *Metal diving armour designed by Roberto Galeazzi*

It may be asked whether for such deep dives the metal diving armour with articulated limbs could not be employed to advantage. Many attempts have been made, both in this country and abroad, to produce such a dress successfully, but with varying results. The most promising before the last war was a German design by Neufeldt & Kuhnke. In 1928 I was responsible for having this apparatus brought to England for the first time, for trial. By arrangement with the designers, I hired the armour for some months for the specific purpose of testing it out, and for a considerable time I lent it to our Admiralty for independent tests. Both the Admiralty and my firm came to the same conclusion, and the apparatus was returned to Germany.

The latest metal armour is that designed by an Italian, Roberto Galeazzi. (I understand the Admiralty has purchased one of these.) It is understood that this armour was tested to a depth of about 800 feet. So far, no reports are available as to its achievements.

The most recent successes in deep water salvage have been those in which the well-tried 'observation chamber' has been employed. One of the earliest examples of the successful employment of this submarine device was, of course, the recovery of over £1,000,000 of gold and silver from the liner *Egypt* in 1932. The efficacy of this method was again proved later in the remarkable salvage operations carried out on the *Niagara*, sunk off the New Zealand coast in 1940. Carrying gold bars worth £2,500,000, this vessel had been mined and sunk at a depth of 438 feet. In the face of war-time difficulties, which included floating mines and the need to improvize much of the salvage equipment from any odds and ends that were not required for more pressing purposes, this operation was concluded successfully. Within 12 months, the major part of the treasure was recovered, a striking tribute to those responsible, which has been recorded elsewhere. The method employed was that the diver in his observation chamber, and in telephonic communication with the Salvage Officers at the surface, controlled the lowering and firing of explosive charges to blast a way to the bullion chamber, as well as controlling the grab to remove the *débris* and finally to lift the gold bars.

Since the second world war, considerable use of this method of salvage at the greater depths has been made for the recovery of cargoes of metal, such as copper and lead, which were in short supply in the post-war years, and whose value made salvage worthwhile. The most recent noteworthy employment of the 'observation chamber' was that in the recovery of the wreckage of the Comet air-liner off Elba, to which I will refer later in connection with underwater television. The great advantage of the 'deep sea observation chamber' is, of course, that the diver is breathing air at atmospheric pressure—air which is kept pure by the regenerative method, using oxygen and CO_2 absorbent, and therefore none of the complications attending the standard dress diver is involved.

The next devices we have to consider are the special chambers specifically designed for exploring the greater depths.

Before the second world war, the depth record in this type of apparatus was held by the American, William Beebe who, in his 'Bathysphere', a spherical chamber of steel, fitted with quartz windows, and equipped with breathing apparatus on the regenerative principle, was lowered and raised by wire ropes from a vessel equipped for the purpose. Beebe reached a depth of 3,028 feet (pressure 0·60 tons per square inch), but that record was beaten by Barton, also an American and partner in Beebe's earlier venture, who descended to 4,500 feet (pressure 0·88 tons per square inch) in a similar chamber.

Later, that intrepid scientist, the eminent Swiss physicist, Professor Auguste Piccard, broke Beebe's and Barton's records completely, when he descended in a 'spherical observation chamber' attached to the bottom of his cleverly designed and original vessel, whose negative and positive buoyancies were controlled entirely by the occupants of the observation chamber. This combination, called the 'Bathyscaphe', made Piccard self-contained and independent of surface-craft, wire-ropes and so forth, such as were used for lowering and raising the Beebe-Barton 'Bathysphere'.

It will be remembered that Professor Piccard's scientific mind had earlier soared to the upper atmosphere where, in a closed chamber supported by his specially constructed balloon, he reached a height of 55,777 feet, at which the reduced pressure is about 1·3 lb. per square inch, as against the normal 14·7 at ground level. After that achievement, he sought a new world to conquer in another element, and designed his 'Bathyscaphe' in which he and his son Jacques were the first to descend in the sea to a depth of 10,335 feet, where the plus pressure is 4,593 lb. = 2·03 tons per square inch.

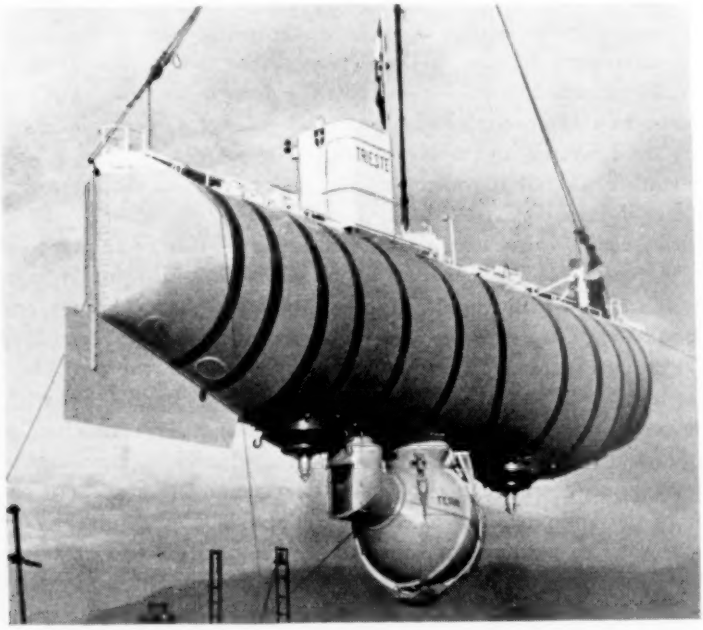

FIGURE 3. *Professor Auguste Piccard's Bathyscaphe*

I am very pleased to announce that we have present with us at this meeting, M. Jacques Piccard, who accompanied his distinguished father, Professor Auguste Piccard, on the memorable descent to 10,355 feet. M. Piccard has kindly consented to give us a description of the 'Bathyscaphe' and its working principles after my paper.

In 1954 two French Naval Officers, Lieut.-Commander Georges Houot and Engineer-Officer Pierre Willm, in a Piccard 'Bathyscaphe', descended to 13,387 feet—where the pressure is 5,900 lb. = 2·63 tons per square inch. The speed of descent, I understand, averaged about one foot per second, and of the ascent accelerated after a slow start to about three feet per second.

The pressure-tight sphere of the 'Bathyscaphe' is equipped with oxygen and CO_2 absorbent sufficient to keep two men in satisfactory respiratory conditions

for 24 hours, together with automatic cameras, scientific recording instruments, and an automatic harpoon gun to acquire specimens of deep swimming fish. I believe that the fish were not noticeably co-operative in getting in line with this weapon. Powerful electric lamps were mounted on the ballast portion, and small electrically-driven propellers gave the craft some lateral radius, whilst a drag-chain gave warning of close proximity to the bottom.

SELF-CONTAINED DIVING APPARATUS

The principle of this type of apparatus is, needless to say, not new, but the conservatism of conventional divers seemed to require the impetus of war to give it their confidence. An apparatus of the 'closed circuit' type, that is, using undiluted oxygen from a cylinder and a chemical CO_2 absorbent, was introduced by my Company 75 years ago, and one design, the 'Salvus A.N.S.', was in fact, standard equipment for shallow water work in the Royal Navy before the last war. In 1929 I submitted a self-contained apparatus using diluted oxygen (fifty per cent air, fifty per cent oxygen) to the Admiralty for trial. It was used from H.M.S. *Cairo* in the Mediterranean for some months and was reported upon as 'entirely satisfactory'.

FIGURE 4. *Human torpedo*

It was, however, the Italian Navy who first used a type of self-contained apparatus belligerently, and successfully, in its underwater attacks on our vessels at Gibraltar and Alexandria in 1941. This provoked quick response from our Admiralty, and by 1942 the Admiralty Experimental Diving Unit was established in the Experimental Department of my Company's main works at Tolworth, Surbiton.

Here, in the ensuing years of the war, were designed, tested and manufactured the many equipments used for 'human torpedoes', 'midget' submarine divers, mine clearance in various forms, and several others for special underwater operations. These were based on the Company's designs, modified to meet the special conditions of military use. The diving apparatus of the 'charioteers'

who manned the 'human torpedoes' was a case in point, since this was an enlarged version of the 'Davis submarine escape apparatus'.

Most exhaustive tests were carried out in our special chambers on many willing volunteers of the Royal Navy to establish the operational limits to which men could work with these underwater weapons. Much valuable data was gained on the subject of the effect of breathing undiluted oxygen under pressure. It is generally accepted that undiluted oxygen breathed at a pressure exceeding 14·7 lb. per square inch, equivalent to 33 feet depth of water, causes oxygen poisoning, a condition bringing on convulsions, unconsciousness and even death. Its effects on individuals are subject to great variation, and there is much more to be learnt on this subject.

An important feature of the closed-circuit oxygen apparatus was the almost complete elimination of surface bubbles, a vital factor in stealthy operations, dependent for their success on the essential element of surprise. For this reason, it was not until after the war, when the war-like approach to apparatus could be—anyhow temporarily—relegated to the background, that we in Britain could transfer our attention to more pleasurable means of utilizing self-contained apparatus. I refer, of course, to the use of the 'aqualung'. With this the diver carries cylinders of compressed atmospheric air—not oxygen—and discharges his exhaled breath into the water. He can, therefore, dive to greater depths with immunity from trouble than if he was diving on pure oxygen.

FIGURE 5. *'Essjee' aqualung compressed air diving apparatus (two-cylinder model)*

I would like to emphasize a note of warning to users of the aqualung. *Always use pure atmospheric air. Never have your cylinders charged with undiluted oxygen. Use clean atmospheric air, free from all impurities, every time.*

Although I have said that pure oxygen can be breathed up to a maximum depth of 33 feet in suitable apparatus, it is essential to eschew pure oxygen altogether when using an aqualung. A number of accidents have occurred through the use of this gas in that type of apparatus. I know of one case where the wearer of an oxygen-charged apparatus, intending to dive no deeper than 25 to 30 feet, was so attracted by the

beautiful scene in a tropical sea, with its colourful growths and inhabitants, that he was tempted to go to double that depth—and did not come up alive.

The twin-cylinder 'Essjee aqualung' has two 1,200 litre (40 cubic feet) cylinders carrying air compressed to 120 atmospheres, or 1,800 lb. per square inch. A reducer and demand valve deliver air to the wearer automatically, according to the need of his lungs. The amount of air used depends upon the degree of exertion of the diver and the depth to which he descends. As examples, and assuming normal light exertion, the twin-cylinder set would last for about 70 minutes at 12 feet, or about 30 minutes at 60 feet. A face-mask and swim-fins are worn with the apparatus. Various accessories are also used with it, such as special suits for the colder waters, depth gauges, compasses, watches, underwater guns and cameras.

In the warmer waters this means of diving for the sport of it was established before the war, but it has advanced greatly in recent years. This has, largely, been due to the enterprise of my friend and associate, Captain J. Y. Cousteau, of the French Navy who, through his publications and films, has done much to popularize underwater sport in several countries. Last summer it took hold in this country and the formation of clubs for the purpose spread rapidly. The aqualung is also used for more serious activities. To mention one of interest, the British School of Archæology at Athens used my firm's Essjee aqualungs for their underwater explorations at Chios last year, and these, I believe, are continuing this summer.

FIGURE 6. *Diver equipped with 'Essjee' aqualung diving apparatus (two-cylinder model), using underwater camera*

UNDERWATER TELEVISION

A most important development, and one which I am confident will grow in utility, and be a great aid to submarine work generally, is the adaptation of television to underseas operations. In 1946 as the result of claims that underwater television had been used by the German Navy during the war, I arranged for Mr. John Gilbert, a Fellow of this Society, and Electronics Consultant of my Company, to visit Germany to investigate. As far as could be ascertained, some development work had been done, but no evidence could be obtained that there had been any practical results.

The first occasion on which this method of underwater observation was put to the test was in the search for the ill-fated submarine *Affray* in 1951. As is well known, a hastily improvized set made by the Admiralty and Messrs. Marconi's succeeded in identifying the wreck. The *Affray* lies at a depth of 276 feet (where the pressure is 126 lb. per square inch), on the very edge of the Hurd Deep, an underseas canyon 80 miles long and, in places, 600 feet deep. Thus, only by chance did she avoid coming to rest at the greater depth, where the pressure is 267 lb. per square inch.

Later, the improved Marconi-Siebe, Gorman equipment was to play an important part in the recovery of the vital wreckage of the Comet air-liner *Yoke Peter*, which crashed off Elba in 1954. Parts of this aircraft were found at depths varying between 400 and 480 feet (pressure between 178 and 214 lb. per square inch). This case was an excellent example of successful collaboration

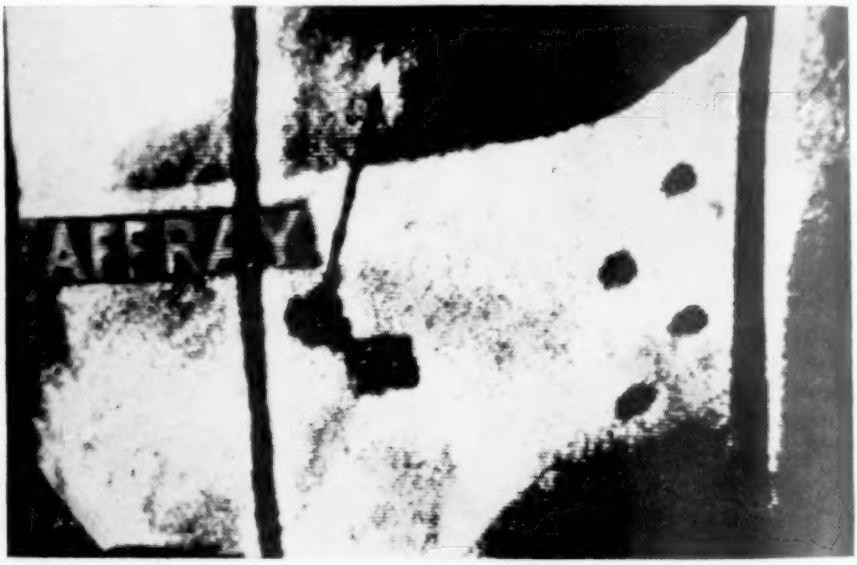

FIGURE 7. *Submarine* Affray, *as seen on the television screen on board the salvage vessel*

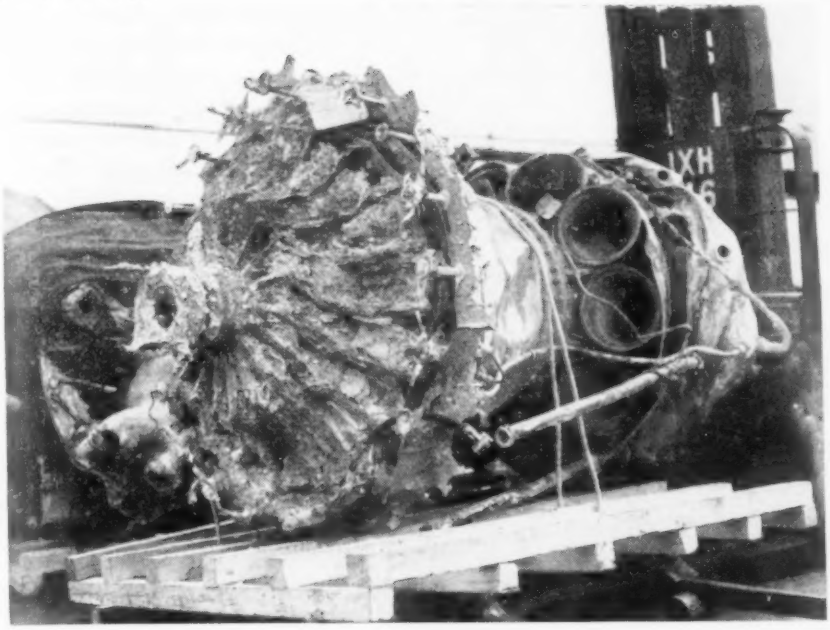

FIGURE 8. *One of the engines of the Comet air-liner* Yoke Peter, *recovered after location of the wreckage with the aid of Marconi-Siebe, Gorman underwater television equipment*

between television, giving its picture on the salvage vessel's screen of the wreckage located, and the submersible observation chamber, lowered to the site of the wreckage on the sea-bed, whose occupant directed by telephone the men at the surface when and where to lower the mechanical grabs for raising the air-liner's remains.

It is not difficult to visualize how useful and time-saving this new equipment will become in marine biological and oceanographic research, inspection of damage to ships' hulls below the water-line, harbour and dock surveys, salvage of ships and their cargoes, and recovery of sunken treasures.

The problems to be overcome in designing practicable underwater television equipment were varied; I will not detain you with these, but will confine myself to a general description of the Marconi-Siebe, Gorman equipment, as used in the Comet search and recovery operations.

Pressure casing

The watertight casing of special steel is cylindrical in shape, as this has the advantage of ease of manufacture and reduction of waste space internally. The thickness of the casing depends, of course, on the maximum depth at which the equipment is to be used. This particular casing was tested for use down to 700 feet, but the construction of casings to go to greater depths does not present

insuperable difficulties. Important parts of the casing are the various watertight glands for the entry of the camera and lighting-cables, and so on. The rear-end of the casing consists of a detachable plate through which the camera-cable from the surface is led. A trunnion is fitted, to which is attached the suspension-cable from the surface, and which provides a movement of ninety degrees from the horizontal to vertically downwards. At the front-end, off-centre, is the viewing port to which I will refer again in a moment.

Lighting

Six 250-watt Tungsten lamps, in watertight housings, are mounted on a radial gantry, and are fed from a junction-box on the side of the casing. These are so arranged as to give even illumination on the target area.

Camera

This is a standard Marconi Mark 'I.B.' unit, suitably modified to allow the various controls to be operated remotely from the surface through the closed-circuit cable.

Viewing port and optical system

A unique feature, and one which marks a great advance in this type of equipment, is the periscope device for viewing the object under examination. Prior to its introduction, a serious defect was that the camera had a fixed lens and, therefore, the whole camera itself had to be moved in order to keep it on a certain object, or to scan a particular area. This, it will be appreciated, was difficult to control from the surface.

The periscopic device, introduced by Messrs. Marconi, largely overcomes this handicap; it is driven by small electric motors mounted on the rear of the lens-assembly, and is controlled by simple and rapid switching at the surface unit; the viewing-port, through which it operates, is made of perspex and is spherical in shape. This device enables the 'eye' of the camera to rove, when looking vertically downwards, in a complete hemisphere, that is, 360 degrees in azimuth, and 90 degrees either way in elevation—all this without movement of the camera-casing, and carried out by one man.

Surface control

The camera-control unit and the remote-control unit at the surface are operated by one man who controls azimuth, elevation, focus, iris and zoom. The units are compact and include the monitor-screen. Additional monitors can be fed off this unit if required.

In certain operations it is found extremely useful to record the view on the monitor-screen by means of still or cine-photography. Since the construction of this particular equipment, Messrs. Marconi and my own firm have made various improvements and modifications and will, unquestionably, be making more as further experience is gained in underwater television work.

THE CUTTING AND WELDING OF METALS UNDER WATER

Another branch of underwater work in which considerable developments have

taken place is the cutting and welding of metals under water by divers. The processes generally employed for cutting are the 'oxy-hydrogen' and the 'oxy-electric arc'. We have found that, while the all-gaseous system ensures somewhat cleaner cuts, the oxy-arc process can be used more successfully at greater depths. Due to lack of sufficient heat, the gaseous system is not suitable for underwater welding.

An oxy-hydrogen steel-cutting torch is shown in use in Figure 9. The compressed air in the annulus, at a pressure slightly in excess of that at the depth of the operation, pushes the water away to allow the heating flame (a mixture of hydrogen and oxygen) to burn freely. The temperatures of the cutting flames are:

FIGURE 9. *Diver using oxy-hydrogen underwater cutting torch*

oxy-hydrogen	4,600° Fahrenheit
oxy-arc	7,000 to 9,000° Fahrenheit (depending upon the length of arc).

The greatest depth at which cutting by the gaseous method can be done efficiently is approximately 120 feet. An advance on earlier processes is that the torch can now be ignited under water—whereas, formerly, it had to be lighted at the surface and, if it went out, returned and relighted. The greatest depth at which oxy-arc cutting can be done is well within the working depth of a diver. Steel plate one inch thick can be cut at the rate of 10½ inches per minute, only a little longer than the rate at the surface.

A diver in one of our experimental tanks took one and a quarter minutes to cut a bar of steel ten inches wide, one inch thick. To weld together two pieces of steel each 6 inches wide by ⅜ inch thick by the electric-arc process, a diver took 2¼ minutes. The oxy-arc cutter is constructed mainly of an insulated hollow rod of alkathene, the valves and holder being of bronze.

INTER-COMMUNICATION BETWEEN DIVERS AND ATTENDANTS

When last I had the privilege of addressing members of the Royal Society of Arts, the type of diver's telephone in use was that requiring headphones for reception, and a carbon microphone mounted inside the diver's helmet for

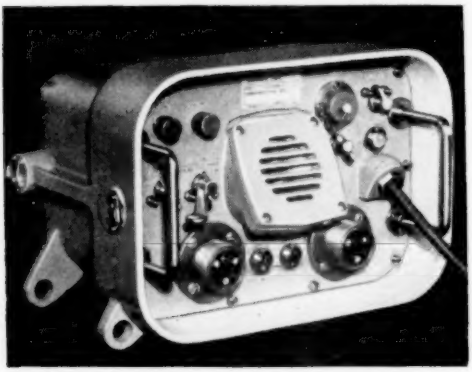

FIGURE 10. *Two-diver thermionic inter-communication telephone*

transmission. These were reasonably efficient, but gave signals at a low level, and were subject to considerable interference from helmet air-supply noises. The advent of the valve amplifier has now enabled the diver's thermionic type of telephone to be evolved. The instrument on view is that at present used by the Royal Navy. (*A small exhibition of diving equipment was on view in the Library during the lecture.*) The chief advantages of this design are that a single transceiver is used in the helmet, instead of the separate microphone and headphone, and that the diver's speech is amplified and received at loud-speaker level at the surface. Sets are designed either for one diver, or for two divers operating together. With the latter, the following functions can be carried out:

(1) The surface attendant can speak to either or both divers at all times.
(2) The divers can speak to the surface attendant.
(3) One diver can talk to the other, each man pressing a chin-push before speaking. The surface attendant can listen-in to their conversation, and can break in if necessary.

These functions are similar to those in connection with the original design of the 'two-diver intercommunication telephone' of A. Graham and myself, designed and patented by us in 1905.

Priority of speech is from the divers to surface, but the surface-control officer can interject at any time to either diver, or to both at the same time. These operations are carried out by simple switching incorporated in the surface instrument, which is also fitted with a buzzer and with indicator-lamps. The supply indicator lamp is white and indicates that the set is switched on, and ready for use. The divers' two indicating lamps, one for each diver, are only illuminated when the divers are communicating between themselves. When number one diver is speaking, his lamp is *red*, and when number two diver is speaking, his lamp is *green*.

The surface unit is compact and watertight, and weighs approximately 35 lb. It is therefore portable and, with its six-volt accumulator, is independent of mains' supply. As with the earlier head-phone type of apparatus, the telephone cable is embedded in the diver's signal-line, which is of standard pattern.

ESCAPE FROM SUNKEN SUBMARINES

Since my lectures in 1934, the Davis escape apparatus (called in the Submarine Service D.S.E.A. for short) has continued as the standard equipment in our submarines. This apparatus on the regenerative system, using

compressed oxygen and CO_2 absorbent, was designed to enable men in impure air, waiting to escape from a disabled submarine, to:

(1) breathe in safety in the apparatus, in the normal way;

(2) escape to the surface;

(3) remain afloat on reaching the surface.

In the last few years, the British Admiralty has shown considerable interest in a method of escape known as 'free escape', which dispenses with artificial breathing apparatus. Briefly, the basis of this method is the fact that the lungs of a man subjected to the pressure at a particular depth contain a correspondingly greater quantity of compressed atmospheric air or other breathing mixture. For example, at 300 feet a man's lungs contain about ten times as much air as when on the surface. As a man rises in the water, the pressure lessens, and so the air in his lungs must expand. In fact, *he must breathe out* if he is not to burst his lungs. The danger of 'breath-holding' has always been stressed by me since the D.S.E.A. was first adopted. During the ascent, therefore, the man must control his exhalations, but never make any attempt to hold his breath. If he has no buoyancy bag, such as he has in the D.S.E.A., or an inflatable stole, he must not exhale too quickly, otherwise he will lose his natural buoyancy and cease to rise.

The simple chart which is reproduced overleaf, I devised in order to illustrate and to emphasize my point. The small circle at the top represents the volume of air in the lungs at atmospheric pressure at the surface; the circles below show the increase in volume respectively at depths down to 330 feet. The printed columns show the sea pressures at various depths, speeds of ascent by men escaping from a submarine by the 'free ascent' method, and ascent by men wearing the D.S.E.A., the latter, alternatively, using or not using the check-vane for slowing down the speed of ascent, as desired.

Last year, as you may perhaps have read, a special 100-foot tank was completed by the Admiralty at Portsmouth, based on the United States Navy's original 130-foot tank at New London, Connecticut. In this, men are trained in the free escape method as well as in the breathing apparatus method.

Methods of escape from submarines can at present be envisaged as follows:

1. *Compartment escape, using a collapsible twill trunk and D.S.E.A.*

In this method, the escape compartment is partially flooded until the pressure equals that of the surrounding sea pressure. First of all, however, an extension, or trunk, of the hatch is lowered to a distance that ensures its lower edge being immersed after the partial flooding. A vent-valve in the escape hatch enables the air trapped in the upper part of the trunk to be released, thus allowing the water to rise to hatch-level inside the trunk. In the rest of the compartment, an air-lock is left in which the men can breathe for a limited period before putting in their mouthpieces. The hatch is then opened, and, one after another, the men duck under the bottom of the trunk, and proceed to the surface.

Depths of Sea-Water		*Pressures*	*Lung contents of air at surface: Red and at different depths and pressures: Blue*	*Atmospheres absolute, i.e. normal atmospheric pressure at surface 14·7 lb. per sq. in., plus pressure at different sea depths*	SUBMARINE ESCAPER		
					Free Ascent	Davis Submerged Escape Apparatus	
Fathoms	Feet	*At surface 14·7 lb. per sq. in.*			*Free ascent, without Breathing Apparatus, but wearing buoyant immersion suit, rate of ascent, 4 ft. per second*	*Using check-cone, rate of ascent, 2 ft. per second (see last para., page 661)*	*Not using check-cone, rate of ascent, 4 ft. per second*
5½	33	29·4		2	8 secs.	16 secs.	8 secs.
11	66	44·0		3	17 secs.	34 secs.	17 secs.
16½	99	58·8		4	25 secs.	49 secs.	25 secs.
22	132	73·5		5	33 secs.	1 min. 6 secs.	33 secs.
27½	165	88·2		6	41 secs.	1 min. 22 secs.	41 secs.
33	198	102·9		7	50 secs.	1 min. 40 secs.	50 secs.
38½	231	117·6		8	58 secs.	1 min. 56 secs.	58 secs.
44	264	132·3		9	1 min. 6 secs.	2 min. 12 secs.	1 min. 6 secs.
49½	297	147·0		10	1 min. 14 secs.	2 min. 29 secs.	1 min. 14 secs.
55	330	161·7		11	1 min. 22 secs.	2 min. 46 secs.	1 min. 22 secs.

FIGURE 11. *Chart illustrating the 'free escape' method*

2. *Compartment escape, using collapsible twill trunk, but adopting the free escape method*

This method is generally similar to number 1, except that D.S.E.A.'s are not worn. Inside the submarine is a built-in breathing system, a gas mixture being stored under pressure in large cylinders. The mixture is led through manifolds to which are attached a number of mouthpieces with inhaling valves on short lengths of flexible tube. The men breathe from the demand valves whilst the compartment is being flooded. When the pressure in the compartment is equal to that of the sea pressure, the hatch is opened, the men fill their lungs through the mouthpieces which they then drop, and carry out their escape *via* the twill trunk.

3. *One-man escape chamber*

In this is used a chamber whose construction is based on that designed by me in 1914. It is built-in to the submarine under a hatch, and has a pressure-tight door or doors leading to one or to two compartments. The escaper enters by one of these doors and can either be wearing a D.S.E.A. or, if adopting the

free escape method, an inflatable stole giving buoyancy to reach the surface. The door is closed and the chamber flooded, leaving an air-lock about two feet deep in which the man can breathe. As soon as the pressure is equalized with that of the depth in which the submarine is sunk, those in the compartment open the upper hatch by means of controls and the escaper floats to the surface. If he does not go up at once, those watching him through an inspection-port in the chamber can operate an ejector-ram, based on an earlier system of escape, to clear the chamber ready for the next escaper.

In all methods of escape special inflatable immersion suits are now worn in order to give protection from cold and exposure at the surface. They are also fitted with inflatable stoles to give buoyancy during the ascent and on reaching the surface. This measure was adopted because, although a number of men had escaped successfully with the D.S.E.A., prevailing conditions of strong tide and rough, bitterly cold weather at the surface had overcome them and swept them away before they could be picked up.

Another method of releasing men trapped in submarines is that using a rescue diving bell based on a 1917 design of mine, and this is regarded by many as the genesis of the idea. This was a bell, or chamber, designed to be lowered and clamped on to the escape hatch of a submarine and by which groups of men could be brought to the surface in succession. It was first put to practical use by the United States Navy who perfected the design, adding a compressed air winch inside for drawing the bell down on to the submarine's escape hatch. The procedure is that a diver goes down first, and shackles the down-haul line of the chamber to the escape hatch. By means of the winch the chamber then pulls itself down on to its seating on the hatch. Its first successful use was in 1939 when 33 men were rescued from the United States Submarine *Squalus*. The Royal Navy has since acquired one of these bells from the United States Government. It will be appreciated that this form of rescue must be regarded in quite a different light from that of individual escapes, as it depends on certain favourable factors, for instance, the need for the close proximity of such a bell and the parent vessel to the locality of the sinking is obvious; the degree of list of the submarine on the bottom has also to be taken into account.

That is a very brief account, in the limited time at my disposal, of the present state of the art of diving under various conditions, and with different types of apparatus. Experiments still go on, and will continue to go on, with the object of achieving greater efficiency in the appliances employed, attaining greater depths of water and, above all, with greater comfort and safety to individuals engaged in various underwater activities. We all pray that the additional aids to submarine escape—whether the D.S.E.A. or the free escape method be employed—may result in complete success in the unfortunate event of another disaster occurring.

DISCUSSION

THE LECTURER: I have very great pleasure in introducing M. Jacques Piccard, son of the famous scientist, Professor Piccard, whose Bathyscaphe Monsieur Piccard will be good enough to describe to you.

M. JACQUES PICCARD: As you know, the Bathyscaphe system invented by my father, Professor Auguste Piccard, fifty years ago, is an adaptation to the sea of the free balloon principle—especially the stratosphere balloon. In each case, we have a completely air and watertight cabin heavier than the exterior fluid—air or water—and each cabin is fixed at the base of its special balloon, which is also lighter than the fluid in which it will operate. In the case of the stratosphere balloon, the cabin is built of aluminium sheet 3·5 millimetres thick, and its great inflatable envelope is filled with hydrogen. In the case of the Bathyscaphe, in order to resist the very high pressure due to the great depth of submergence, the spherical cabin, which is 6½ feet in diameter and weighs 10½ tons, is built of steel 3½ inches thick, increasing to six inches thick at the entrance and the porthole. The working principle is based on the fact that petrol is compressible, contracts under high pressure, and expends again on release of the pressure.

The Bathyscaphe's buoyant vessel is 55 feet long, and 11 feet in diameter at its widest part, and is constructed of aluminium sheet 3·5 millimetres thick. It is divided into several compartments all of which form closed tanks, excepting two which are called compensating chambers, and are open at the bottom for ingress and egress of the sea at a pressure equivalent to the depth of the vessel's submergence. The closed tanks, which are all connected by small bore tubes to each other and to the compensating chamber, are charged with 17,000 gallons of petrol (specific gravity 0·66–0·7, against water 1·0). The sea pressure entering the compensating chambers is communicated to the petrol whose reduced volume allows water to enter in quantity sufficient to increase the specific weight of the Bathyscaphe by nearly one ton for every kilometre of depth.

It is, of course, necessary to carry several tons of ballast for a very deep submergence, and to provide means for jettisoning it by instruments controlled from the pilot's cabin. Several tons of the ballast are in the form of small iron shot contained in cylinders, and maintained in position by electro-magnets. The release of this ballast is by a time weight device; for example to jettison, say, three cwt., the electric current is cut off by 15 seconds, and so on. Ballast in other convenient forms is also carried. The Bathyscaphe is also equipped with a special valve to allow the release, in emergency, of a certain quantity of petrol when the pilot wishes to increase the speed of descent, or to reduce the speed of ascent.

Entrance to the cabin is by ladder down a watertight tubular shaft with a hatch at the top. When the pilot and his companion are safely locked in their sphere, the shaft-hatch is closed, and then flooded with sea water, which acts as sinking ballast for the start of the Bathyscaphe's descent.

When the Bathyscaphe has reached bottom, and the pilot and his passenger have observed that part which can be seen through the principal periscopic window, it is possible to move the vessel to another position; for this purpose, she is fitted with two small propellers driven by two horse-power electric motors. The speed is slow, but the purpose is not to cross the ocean; and it really is very fascinating to survey the bed of the sea leisurely, and to view the ground one or two metres below you: the sea bed, the rocks, the different kinds of fish large and small, and all kinds of mysteries of this new world. It is necessary to illuminate the sea with our own projectors when the Bathyscaphe reaches a certain depth, since darkness is complete after several hundred metres. Our high tension projectors give sufficient light for the taking of photographs and cine-films.

Other details increase further still the similitude of the Bathyscaphe and its elder brother, the hydrogen balloon. In order to remain at a constant level (one-two metres) during the 'submarine walk' the Bathyscaphe is equipped with a steel guide-rope twenty metres long, weighing fifty kilograms, and reaching the ground under it. The weight of the rope can equilibrate the vessel if the apparent weight in water of

the Bathyscaphe is less than fifty kilograms. This system is used in every balloon ascension.

It would be possible to speak much longer about the Bathyscaphe, but I will now only express the hope that the invention will be utilized by oceanographic specialists for scientific research, and for humanitarian purposes, and so perform the mission for which my father and I have designed it.

THE CHAIRMAN: I think we have this afternoon listened to a most interesting paper, and I am sure that it has opened some of our eyes to the great extent to which not only the quest to penetrate further and further into the depths of the ocean is always being pursued, but the way in which the task of improving the efficiency of the men under water is always being worked upon.

You will see that modern developments such as television are rapidly adapted to under-water work and while, in the case of this particular invention, it is perhaps unfortunate that its most necessary uses have been in connection with major disasters, we hope that the experience gained on these particular salvage feats will lead to improvements in the technique of using such apparatus in far less tragic circumstances.

Sir Robert Davis has only been able to touch very lightly upon submarine escape, which is in itself a separate subject and contains a great number of problems. While we all hope that it will never again be necessary to call escape apparatus into use, we must join Sir Robert in his fervent prayer that the latest methods which have been developed will prove effective in saving human life.

We have also, I think, had a unique experience of hearing a first-hand account of a Bathyscaphe by M. Jacques Piccard. In proposing a vote of thanks to Sir Robert Davis, I should like also to thank M. Piccard for giving up his valuable time during his short stay in this country to come here and talk to us.

A vote of thanks to the Lecturer was carried with acclamation; and, another having been accorded to the Chairman, the meeting then ended.

GENERAL NOTES

ART EXHIBITION

An exhibition of paintings by Satish Gujral is being held at present at the Imperial Institute, South Kensington. The exhibition, which is sponsored by the Royal India, Pakistan and Ceylon Society, will remain open until 3rd July. Admission is free.

ELECTRONICS EXHIBITION

The tenth annual Electronics Exhibition is to be held at the College of Technology, Manchester, from 14th to 20th July, 1955. The exhibition will contain a scientific and industrial research section, and a manufacturer's section. Also, forty lectures and a number of film shows on allied subjects, will be held.

Further particulars may be obtained from The Honorary Organizing Secretary, 78 Shaw Road, Thornham, Rochdale, Lancs.

INSTRUMENT EXHIBITION

The British Instrument Industries Exhibition is to be held at Earls Court, London, from 28th June to 9th July, 1955. The latest developments in the design of instruments for all branches of science and industry will be exhibited, as well as equipment for air and sea navigation and land surveying.

NOTES ON BOOKS

MODERN LETTERING AND CALLIGRAPHY. *Edited by Rathbone Holme & Kathleen M. Frost. Studio Publications*, 1954. 25*s*

This sequel to *Lettering of To-day* (which was published in 1937) is divided into the same four sections as the earlier work, the contributors, each of whom writes an introduction to his own section, being Mervyn C. Oliver on Calligraphy, Ruari McLean on Modern Lettering in Book Production, George Mansell on Lettering in Association with Architecture, and Frederick A. Horn on Lettering in Advertising. The illustrations are of international work since 1945 and it is interesting to compare the general styles apparent with those in the 1937 volume. As always this is a valuable compendium of some of the best work carried out in these years and it is reasonably priced. The jacket, by Mr. Horn, is disturbing. It has what Mr. Horn's colleagues would call 'good hard sell', but one wonders whether it is, in this case, the right 'sell' for the book.

MICHAEL OLIVER

LIBRARY ADDITIONS

LIBRARIES, MUSEUMS AND SOCIETIES

ROYAL INSTITUTE OF BRITISH ARCHITECTS—Library Catalogue. . . . Volume I: Author catalogue of books and manuscripts; (volume II: classified index and alphabetical subject index of books and manuscripts). *London, Royal Institute of British Architects*, 1937–1938.

INSTITUTION OF NAVAL ARCHITECTS—Catalogue of the Scott collection of books, manuscripts, prints and drawings; compiled by Betty M. Cooper. *London, Institution of Naval Architects*, 1954. Presented by the Institution of Naval Architects.

ECONOMICS

LEWIS, JOHN SPEDAN—Fairer shares: a possible advance in civilization and perhaps the only alternative to communism. *London, Staples press*, 1954. Presented by the author.

EDUCATION

BROOKS, COLLIN—An educational adventure: a history of the Woolwich Polytechnic, 1955. *Woolwich Polytechnic*, 1955. Presented by Woolwich Polytechnic.

PEDLEY, ROBIN—Comprehensive schools to-day: an interim survey; with new critical essays. *London, Councils and education press*, [1955].

SCIENCE

ANTHONY, HERBERT DOUGLAS—Science and its background. 2nd edition. *London, Macmillan*, 1954.

HOWARD, LOUISE ERNESTINE, *Lady Howard*—Sir Albert Howard in India. *London, Faber*, 1953.

KENDALL, JAMES—Humphry Davy: 'Pilot' of Penzance. *London, Faber*, 1954.

KENDALL, JAMES—Michael Faraday: man of simplicity. *London, Faber*, 1955.

SHAW, PETER—Chemical lectures, publicly read at London, in the years 1731 and 1732; and at Scarborough in 1733; for the improvement of arts, trades, and natural philosophy. Printed for *T. and T. Longman* . . ., MDCCLV [1755].

SUTTON, OLIVER GRAHAM—Mathematics in action. . . . *London, Bell*, 1954.

TAYLOR, EVA GERMAINE RIMINGTON—The mathematical practitioners of Tudor and Stuart England. *Cambridge, C.U.P.*, for the Institute of Navigation, 1954.

AGRICULTURE AND GARDENING

MERCER, FRANK A., *and* HAY, ROY, *editors*—Gardens and gardening: the Studio gardening annual. Vol. VI, Growing under glass, [and], Garden maintenance and equipment. *London, Studio publications*, 1955.

ENGINEERING, TRADE AND INDUSTRY

BALSTON, THOMAS—William Balston, paper maker, 1759–1849. *London, Methuen*, 1955.

ROWLAND, JOHN—George Stephenson, creator of Britain's railways. *London, Odhams press*, 1954.

SINGER, CHARLES, *and others, editors*—A history of technology; edited by Charles Singer, E. J. Holmyard and A. R. Hall, assisted by E. Jaffé, F. H. G. Thomson and J. M. Donaldson. Vol. I: From early times to fall of ancient empires. *Oxford, Clarendon press*, 1954. Presented by I.C.I.

INDUSTRIAL AND COMMERCIAL ART AND DESIGN

ASHFORD, FREDERICK CHARLES—Designing for industry: some aspects of the product designer's work. *London, Pitman*, 1955.

MAYNARD, ALISTER, *editor*—The value of good design: a report on the Scottish Design Congress, Edinburgh, 1954. *Glasgow, Council of industrial design Scottish committee*, [1954].

SIMON, OLIVER—Introduction to typography. Revised ed. *London, Penguin books in association with Faber*, 1954.

ARCHITECTURE AND BUILDING

HARADA, JIRO—The lesson of Japanese architecture. Revised ed. *London, Studio publications*, 1954.

LEES-MILNE, JAMES—The age of Inigo Jones. *London, Batsford*, 1953.

PAPADAKI, STAMO, *editor*—Le Corbusier: architect, painter, writer. . . . *New York, The Macmillan company*, 1948.

SHAND, PHILIP MORTON—Building: the evolution of an industry. . . . *London, Token construction company limited*, 1954. Presented by the Token Construction Co. Ltd.

THOMAS, HYLTON—The drawings of Giovanni Battista Piranesi. . . . *London, Faber*, 1954.

TURNOR, REGINALD—The smaller English house, 1500–1939. *London, Batsford*, 1952.

CRAFTS AND LIGHT MANUFACTURES

ARTARIA, PAUL, *editor*—Carl Malmsten: . . . Swedish furniture. *Basle, Wepf & Co. Verlag*, 1954. Presented by Professor Carl Malmsten.

FLANAGAN, J. F.—Spitalfields silks of the eighteenth and nineteenth centuries; introduction by J. F. Flanagan. *Leigh-on-sea, F. Lewis publishers ltd.*, 1954.

HOLDEN, GEOFFREY—The craft of the silversmith. *London, Studio publications*, 1954.

MALMSTEN, CARL—Mittens rike: [en bok om handens verk och mänsklig odling]. *Stockholm, Nyckelförlaget*, 1949. Presented by the author.

MARYON, HERBERT—Metalwork and enamelling: a practical treatise on gold and silversmiths' work and their allied crafts. . . . 3rd ed. revised. *London, Chapman and Hall*, 1954.

FINE ARTS

CANADA—Royal Commission on National Development in the Arts, Letters and Sciences, 1949–1951. Report. *Ottawa, Edmond Cloutier*, 1951.

CLARK, ELIOT—History of the National Academy of Design, 1825–1953. *New York, Columbia U.P.; London, O.U.P.*, 1954.

THE CONNOISSEUR—Year book, 1955; edited and compiled by L. G. G. Ramsey. . . . *London, The Connoisseur*, [1954].

LEHNER, ERNST—Symbols, signs and signets. *Cleveland, World publishing company*, 1950.

MONCRIEFFE, IAIN *and* POTTINGER, DON—Simple heraldry. *London, Nelson*, 1953.

RICE, DAVID TALBOT—Teach yourself to study art. *London, English U.P.*, [1955].

TAUBES, FREDERIC—New essays on art. *New York, Watson Guptill publications*, 1955.

TREASURY—Committee on the export of works of art. Report. *London, H.M.S.O.*, 1952.

PAINTING, DRAWING, SCULPTURE AND ENGRAVING

BERTRAM, ANTHONY—Rembrandt. *London, Studio publications*, 1955.

BERTRAM, ANTHONY—Sickert. *London, Studio publications*, 1955.

BUCKLAND-WRIGHT, JOHN—Etching and engraving: techniques and the modern trend. *London, Studio publications*, 1953.

COURTHION, PIERRE—Dufy (1877–1953). . . *London, Faber*, 1955.

FAIRBANK, ALFRED—A handwriting manual. New and enlarged ed. *London, Faber*, 1954.

GLUCK—The dilemma of the painter and conservator in the synthetic age; a paper read at the Museums Association conference at Edinburgh, 21st July, 1954. Presented by the author.

HOAR, FRANK—Pen and ink drawing, by Acanthus (Frank Hoar). *London, Studio publications*, 1955.

JOHNSON, CHARLES WILLIAM HEATON—Memlinc (born about 1438: died 1494). . . . *London, Faber*, 1955.

FROM THE JOURNAL OF 1855

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From the Report from the Council to the Society, on the close of the One Hundred and First Session.

The important position which the Microscope now holds, not only in relation to pure but to applied science, and its great value in assisting to form those habits of observation which it is the object of all sound education to impart, induced the Council to believe that the promoting the production of a good instrument at a price which should render it more readily accessible to the many, was an object worthy of the Society; and, accordingly, under the advice and with the assistance of a Committee, composed of Mr. Busk, F.R.S.; Dr. Carpenter, F.R.S.; Mr. Jackson; Dr. Lankester, F.R.S.; Mr. Quekett; and Mr. W. W. Saunders, F.R.S., the following prizes were offered:

For a 'School' Microscope, to be sold to the public at a price not exceeding 10*s.* 6*d.*—*The Society's Medal.*

For a Teacher's or Student's Microscope, to be sold to the public at a price not exceeding £3 3*s.*—*The Society's Medal.*

The Council undertook to purchase 100 of the smaller, and 50 of the larger instruments for which the medals should be awarded.

The members will be glad to learn that for these prizes there have been numerous competitors. After most careful examination of all the instruments by the Committee, they unanimously reported to the Council that the instruments sent in by Messrs. Field and Co., of Birmingham, fulfilled all the conditions required, and the Council have, therefore, awarded to that firm the medals offered, on Messrs. Field and Co. entering into the necessary undertakings to comply with the requirements of the Prize List. The Council congratulate the members on this result. Those members who are desirous of securing any of these instruments, which will shortly be supplied to the Society by Messrs. Field, at a discount of 10 per cent., should at once send in their names to the Secretary.